TECHNICAL REFERENCE
HARDWARE

Version 11.01 - January 2013

XS.

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Improvement Requests

Your comments will help us improve the quality of the user documentation. Do not hesitate to send improvement requests, or report any error or inaccuracy on this user manual by e-mail to doc@evs.com.

Regional Contacts

The address and phone number of the EVS headquarters are usually mentioned in the Help > About menu in the user interface.

You will find the full list of addresses and phone numbers of local offices either at the end of this user manual (for manuals on hardware products) or at the following page on the EVS website: http://www.evs.com/contacts.

User Manuals on EVS Website

The latest version of the user manual, if any, and other user manuals on EVS products can be found on the EVS download center, on the following webpage: http://www.evs.com/downloadcenter.

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What's New?

The new features added on release 11.01 do not have an impact on the hardware technical reference manual of this EVS server.

The manual has however been subject to slight changes to reflect the current situation:

Section	Description
6.6	The type of the MTPC board mounted on new servers is HS873 (revision A3/A6).
4.1	New references to SMPTE standards and new standard reference for 3G-SDI.
4.2 - 5.2	Corrections in available audio configurations.
5.7.5	Update in the list of supported switches
4.3.2	Updates in maximum bitrate values per codec.
4.4.3	Update in RT Channels bitrate in DNxHD® and Pro Res codecs.

1. Overview

1.1. Presentation

Welcome to the EVS range of products and thank you for using an EVS XS server. We will do our best to satisfy your video production needs and we look forward to continuing working with you.

The EVS XS servers are full digital in PAL (625i), NTSC (525i), 720p, 1080i, and 1080p standards. These multi-channel, disk-based video servers are specifically designed for studio applications, to satisfy the needs of near-live and pre-recorded studio productions.

XS servers are available in 5U chassis (2- or 4- channel configurations) or 6U chassis (4- or 6-channel configurations).

The XS servers offer configurations with maximum 6 video channels SD/HD and, optionally, 6-channel 3D/1080p.

XS servers work with SAS disks: they are equipped with internal SAS disk array and/or can be connected to a SAS-HDX external SAS disk array.

They can be used with various third party controllers, applications, and automation systems using industry-standard protocols such as Sony BVW75, VDCP, Odetics, DD35, IPDP, or EVS AVSP, EditRec, LinX API.

They natively support a wide range of HD codecs, such as M-JPEG, Avid DNxHD®, VC-3, Apple ProRes®, MPEG-2 intra, Panasonic DVCPRO HD, and AVC-Intra Class 100, as well as SD codecs.

XS servers can also be controlled by EVS applications:

IPDirector: a suite of Windows software applications designed to manage networked EVS video servers. Its applications make it possible to control multiple channels within the XNet2 network, as well as to log an event, to create and manage clips and play-lists with advanced functions, among others to extract clips from a VTR. It also provides extensive database search features.

INSIO: an interface to manage single or multi-camera ingests, instant review, clip transfer and streaming to editor and storage, as well as production notes.

2. Safety and Compliance

2.1. Safety

This equipment has been designed and tested to meet the requirements of the following:

- EN 60950 (European): Safety of information technology equipment including business equipment.
- IEC 950 (International): Safety of information technology equipment including business equipment.

In addition, this equipment has been designed to meet the following:

- UL 1950 - USA (USA): Safety of information technology equipment including business equipment.

2.2. EMC Standards

This equipment complies with following EMC standards:

Standard	Area	Title
EN 55022	European	Emission Standard
EN 61000-3-2	European	Electromagnetic Compatibility (EMC) Part 3 (Limits); Section2 ; limits for harmonic current emissions (equipment input current <16A per phase)
EN 61000-3-3	European	European Electromagnetic Compatibility (EMC) Part 3 (Limits), Section 3; limitation of voltage fluctuation and flicker in low-voltage supply systems for equipment with rated current of 16 A.
EN 61000-4-3	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 3; Testing and measurement techniques - Radiated, radio-Frequency, electromagnetic field immunity test.
EN 61000-4-4	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 4; Testing and measurement techniques - Electrical fast transient/burst immunity test.
EN 61000-4-5	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 5; Testing and measurement techniques - Surge immunity test.
EN 61000-4-6	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits); Section 6 ; Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.

Standard	Area	Title
EN 61000-4-7	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 7; harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto.
EN 61000-4-11	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits); Section 11 ; Voltage dips, short interruptions and voltage variations immunity tests.
EN 50082-1	European	European Generic Immunity Standard – Part 1: Domestic, commercial and light industry environment.
FCC	USA	Conducted and radiated emission limits for a Class A digital device, pursuant to the Code of Federal Regulations (CFR) Title 47 – Telecommunications, Part 15: Radio Frequency devices, subpart B-Unintentional Radiators.

2.3. EMC Warning

Changes or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

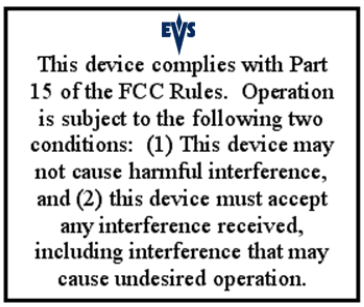
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

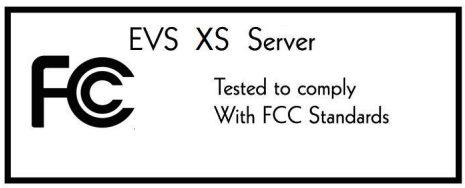
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.4. FCC Marking

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

The following labels are affixed on the equipment:


This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



2.5. CE Marking

The CE marking is affixed to indicate compliance with the following directives:

- 89/336//EEC of 3 May 1989 on the approximation of the laws of the Members States to electromagnetic compatibility.
- 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Members States relating to electrical equipment designed for use within certain voltage limits.
- 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

3. Hardware Specifications

3.1. Mechanical Dimensions and Weights

3.1.1. Rack Mount 5U Main Frame

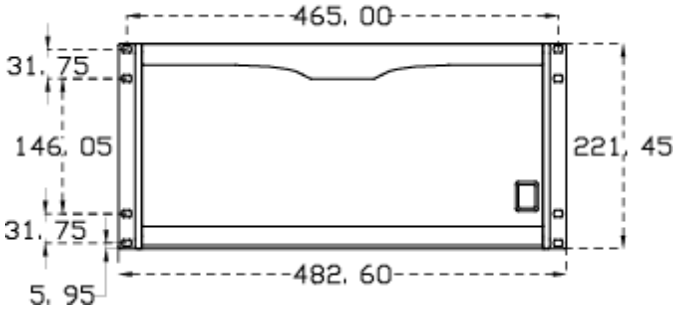
Weight

Disk Configuration	Weight
5U - 19 inches chassis with 6 HDD on RCTL board (fix mounted)	29 kg / 63.9 lb
5U - 19 inches chassis with 12 HDD on RCTL board (fix mounted)	31 kg / 68.3 lb
5U - 19 inches chassis with 6 HDD on hot swap rack	31 kg / 68.3 lb
5U - 19 inches chassis with 12 HDD on hot swap rack	33 kg / 72.7 lb

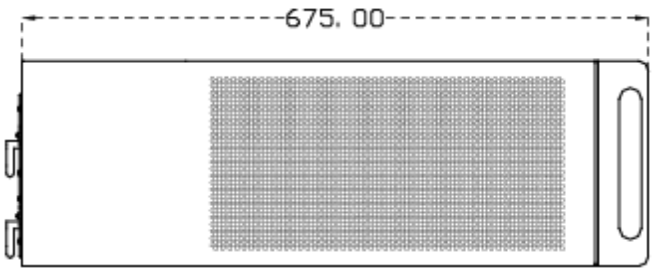
Dimensions

The following drawings provide the various dimensions, in mm, of the XS server with a 5U chassis.

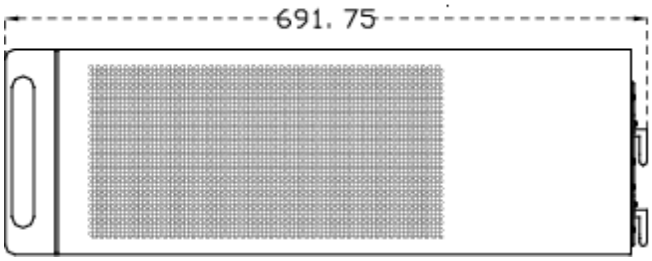
Front view



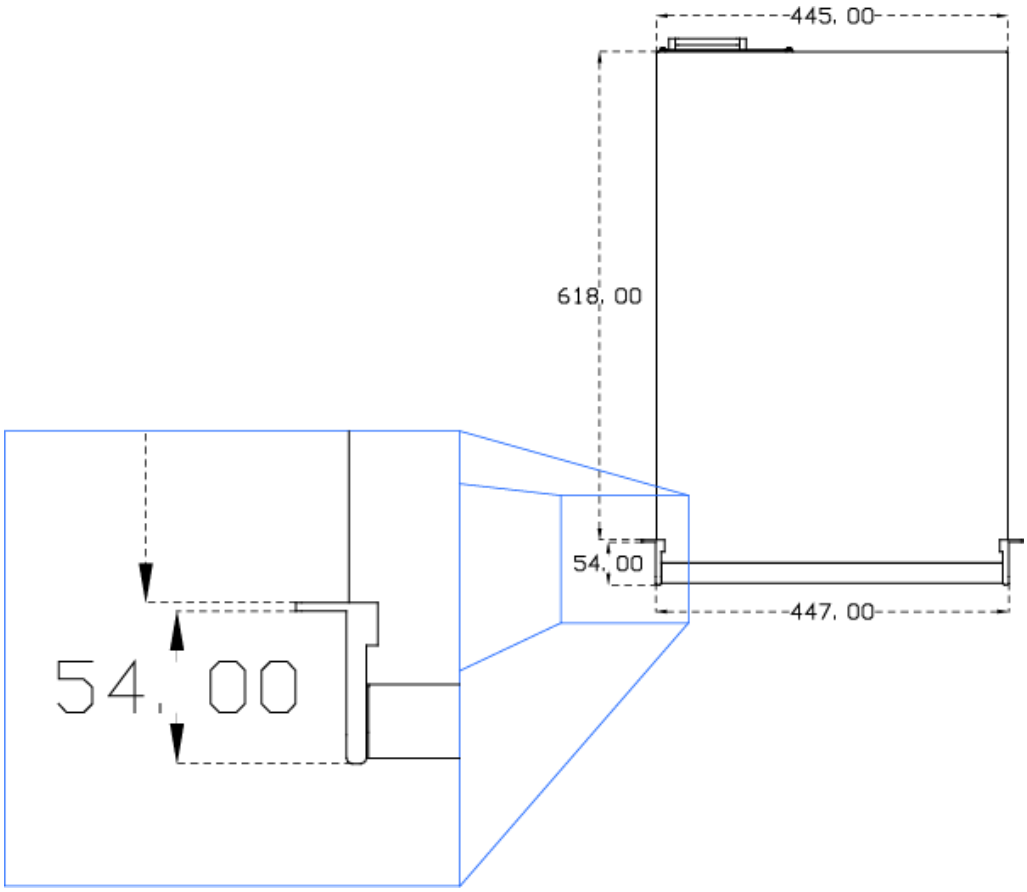
Left view



Right view



Top view



3.1.2. Rack Mount 6U Main Frame

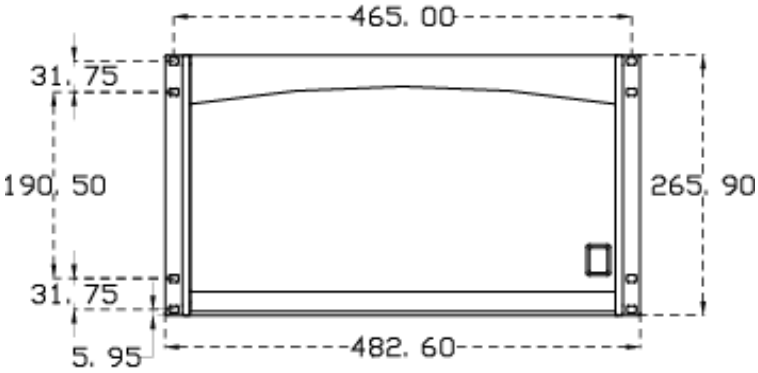
Weight

Disk Configuration	Weight
6U - 19 inches chassis with 6 HDD on RCTL board (fix mounted)	35 kg / 77.2 lb
6U - 19 inches chassis with 12 HDD on RCTL board (fix mounted)	37 kg / 81.6 lb
6U - 19 inches chassis with 6 HDD on hot swap rack	37 kg / 81.6 lb
6U - 19 inches chassis with 12 HDD on hot swap rack	39 kg / 86.0 lb

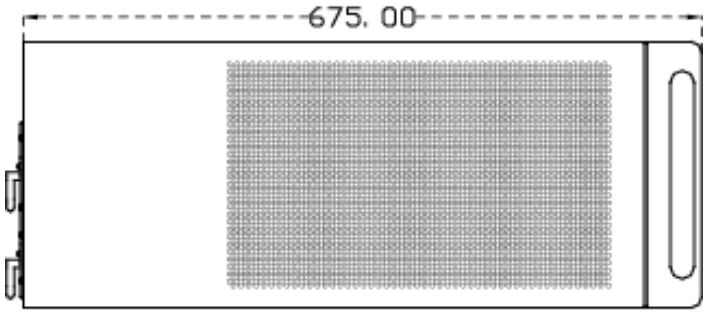
Dimensions

The following drawings provide the various dimensions, in mm, of the XS server with a 6U chassis.

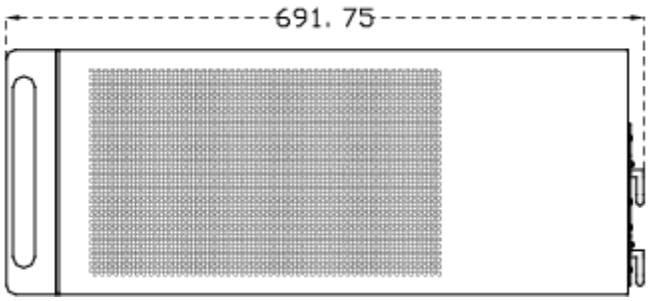
Front view



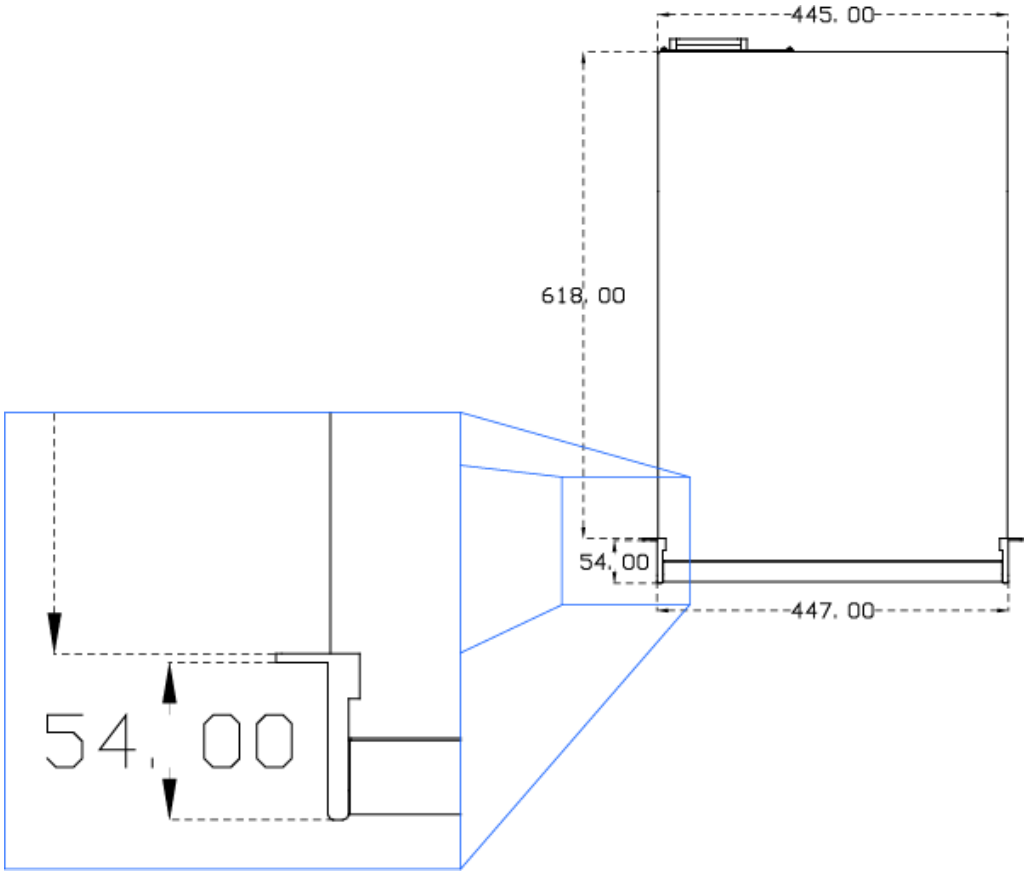
Left view



Right view

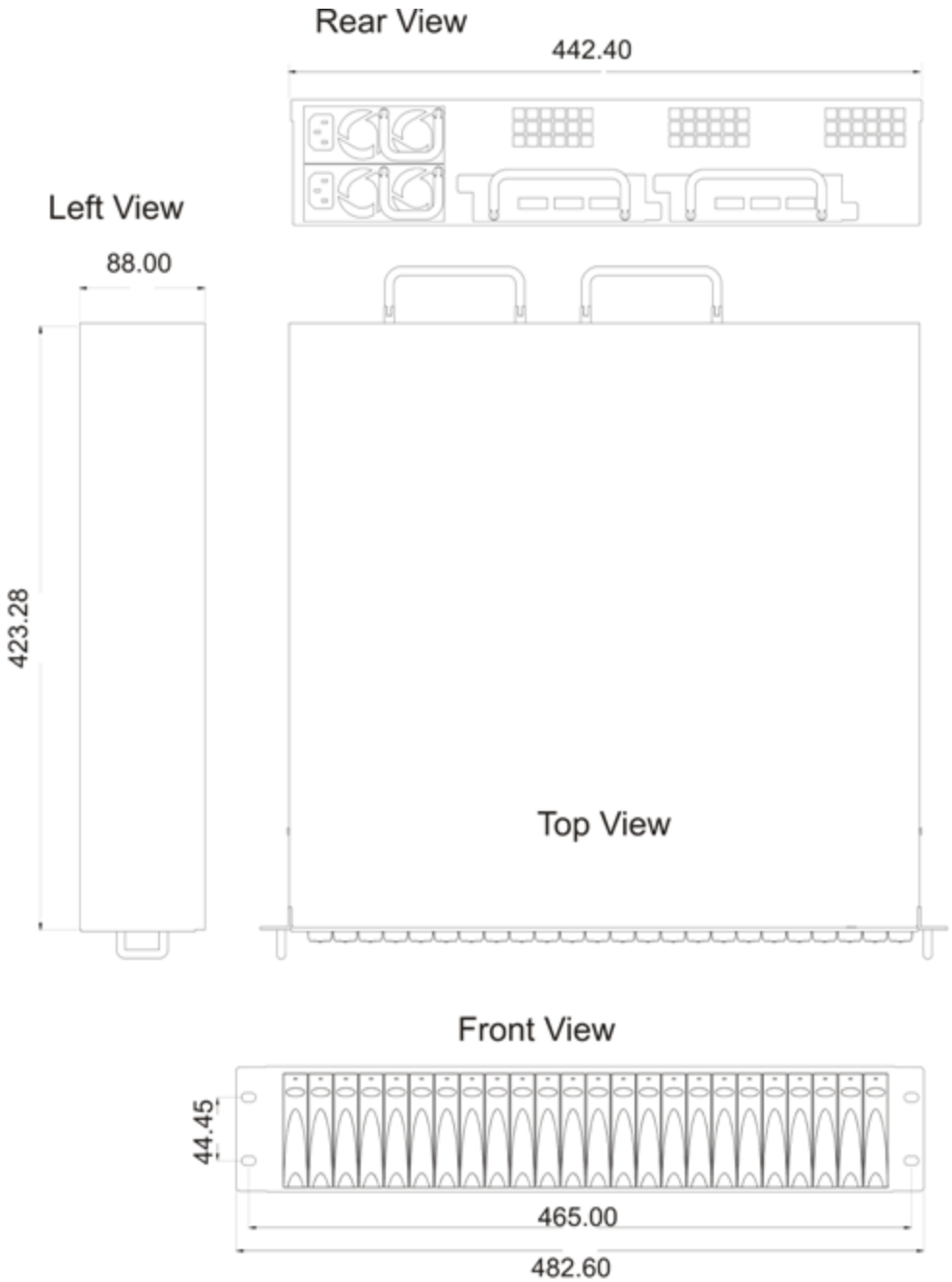


Top view



3.1.3. SAS-HDX Unit

The following drawings provide the various dimensions, in mm, of the SAS-HDX external array.

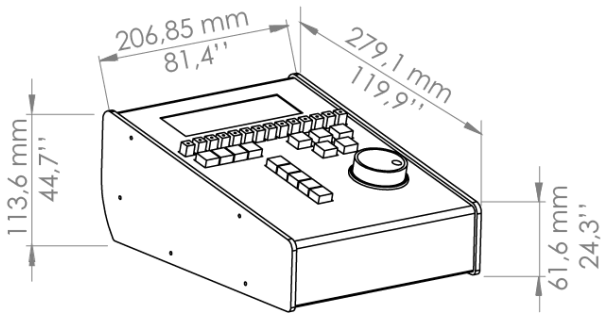


For more information on the SAS-HDX, refer to "External RAID Array SAS-HDX" on page 85.

3.1.4. Control Devices

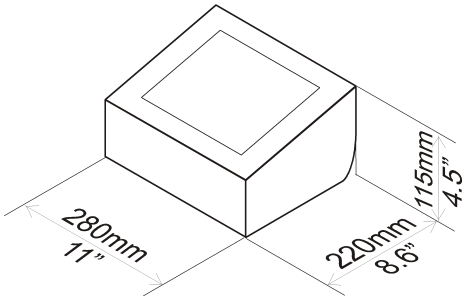
The following control devices can optionally be connected to your server to control it.

XSense Remote Control Panel



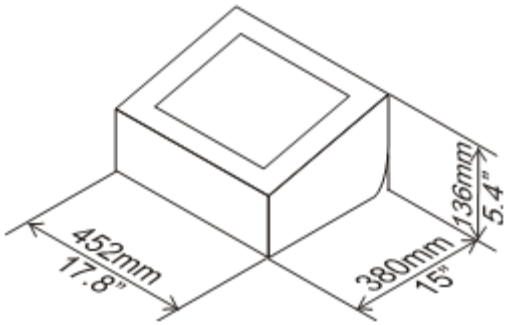
10” Touch Screen Video Monitor

Weight: 3.6 kg / 7.8 lb.



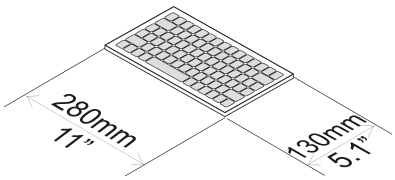
18” Touch Screen Video Monitor

Weight: 11.0 kg / 23.9 lb.



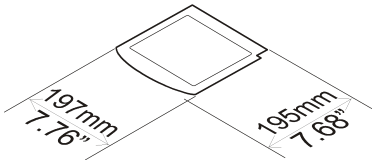
Keyboard

Weight: 0.4 kg / 0.9 lb.



Tablet

Weight: 0.3 kg / 0.66 lb. (Ref: Wacom® CTF-430 Bamboo One)



3.2. Power Supply

Redundant Power Supply

The server is fitted with two auto switching and hot-swappable power supplies.

The secondary hot-swappable power supply should be connected to the mains to allow automatic power switching to this second power supply should the first one fail.

Grounding

Warning

The protective earth must be connected to the ground before powering up the unit.

Ensure the disk recorder unit is properly grounded at all times to avoid electrical shock hazard.

Electrical Specifications

Rated voltage: 115 to 240 VAC (single phase)

Rated frequency: 47-63 Hz

Input connector: CEE 22/IEC 320 3-pin male receptacle

Connection to supply: Pluggable equipment Type A (EN 60950 §1.2.5): Equipment which is intended for connection to the building power supply wiring via a non-industrial plug and socket-outlet or a non-industrial appliance coupler or both. Correct mains polarity must always be observed. Do not use reversible power plugs with this equipment.

Class of equipment: Class 1 equipment (EN 60950 § 1.2.5): electric shock protection by basic insulation and protective earth.

Electrical Consumption

The following electrical specifications are valid for the XS 6U server:

Data Type	Voltage	Value
Inrush current (PSU plugged on power grid)	230 V	3.6 A
Maximal current (full load, CPU at 100%)	230 V	1.5 A
Inrush current (PSU plugged on power grid)	110 V	7.6 A
Maximal current (full load, CPU at 100%)	110 V	3.2 A
Maximal power consumption (full load, CPU at 100%)	-	350 W

3.3. Environmental Conditions

Operating

- Temperature: 10°C to + 50°C (50°F to 122°F) ambient with free air flow
- Relative humidity: 0% to 90% (non-condensing)
- Cooling requirements: Forced air cooling air flow from front to back
- Handling/movement: Designed for fixed use when in operation

Storage and Transport

- Temperature: 0°C to +70°C (32°F to 158°F)
- Relative humidity: 0% to 90% (non-condensing)

4. Software Specifications

4.1. Video Specifications

Video Standards

The following table lists the video specifications both in SD and in HD format for your XS server.

	Standard Definition	High Definition
Video Formats	525i 59.94fps (NTSC) 625i 50fps (PAL)	720p 50/59.94fps 1080i 50/59.94fps 1080p 50/59.94fps (DualLink or 3G)
Digital Interface	10-bit 4:2:2 Serial (ST 259:2008). Full frame synchronizer at input. Dual output for PLAY channels.	10-bit 4:2:2 Serial (ST 292-1:2011). Full frame synchronizer at input. Dual output for PLAY channels.
Number of Channels	2, 4 or 6 channels, reversible REC/PLAY	2, 4 or 6 channels, reversible REC/PLAY
Monitoring & Down-converters	1 CVBS per channel, with OSD 1 SD SDI per channel, with OSD	1 built-in down-converter per channel, CVBS output with OSD 1 HD SDI output per channel, with OSD Additional clean SD SDI output
Reference	Analog Black Burst	Analog Black Burst and HD Tri-Level Sync
Graphics Board	n.a.	n.a.

SMPTE Standards

The following table lists the SMPTE standards supported by your server.

Configuration	SMPTE standard
SD SDI	ST 259:2008 (525i 59.94 Hz; 625i 50 Hz)
HD SDI	ST 292-1:2011, ST 292:2012 (720p 50 and 59.94 Hz; 1080i 50 and 59.94 Hz)
Embedded audio HD	ST 299-0:2010, ST 299-1:2009
AES/EBU audio	ST 272:2004
LTC	ST 12-1:2008, ST12-2:2008
D-VITC	ST 266:2012
Ancillary TC in HD	RP 188
Vertical Ancillary Data	ST 334:2000
VC-3	ST 2019-1:2008
IMX D-10	ST 356:2001
Dual Link 1.5 Gb/s	ST 372:2011
Mapping of Audio Metadata into Vertical Ancillary data	ST 2020-2:2008, ST 2020-3:2008
3G SDI	ST 424:2006
3G SDI – Data mapping	ST 425-B:2008

4.2. Audio Specifications

Audio Analog and Digital Configurations

5U Server + 6U Server (2 channels)

The following optional audio configurations are available:

- **Configuration BNC AES/EBU + DA-15 Analog:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E unbalanced on 16 BNC connectors
  - 8 input and 8 output analog balanced channels on 4 DA-15 connectors
- **Configuration DA-15 AES/EBU + DA-15 Analog:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E on 4 DA-15 connectors
  - 8 input and 8 output analog balanced channels on 4 DA-15 connectors

6U Server (6 and 4 channels)

The following optional audio configurations are available:

- **Configuration BNC AES/EBU + XLR Analog:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E unbalanced on 16 BNC connectors
  - 8 input and 8 output analog balanced channels on 16 XLR connectors
- **Configuration XLR AES/EBU + DA-15 Analog:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E on 16 XLR connectors
  - 8 input and 8 output analog balanced channels on 4 DA-15 connectors

Additional Audio Specifications

- 4 additional analog balanced output channels for monitoring
- All audio connectors on mainframe

The 5U servers provide:

- Up to 64 embedded audio channels (4*16 audio mono channels per video channel)

The 6U servers provide:

- Up to 96 embedded audio channels (6*16 audio mono channels per video channel)

Audio Processing

- Uncompressed audio
- 24 bit processing and storage
- Sample rate converter from 25-55 kHz to 48 kHz
- Audio scrub
- Audio mix

4.3. Video Codecs and Bitrates

4.3.1. Supported Codecs

Codecs and Related License Codes

The XS server uses an intra-frame video encoding technique. It supports natively the following video codecs:

Codec	SD	HD	Code Protection
M-JPEG	√	√	No
DVCPro 50	√	-	Code 9
IMX	√	-	No
Intra-frame MPEG-2	-	√	No
Avid DNxHD®	-	√	Code 5
Apple ProRes 422	-	√	Code 6
Apple ProRes 422 HQ	-	√	Code 6
Apple ProRes 422 LT	-	√	Code 6
DVCPro HD	-	√	Code 8
AVC-Intra 100	-	√	Code 13

The code-protected codecs are solely available when the corresponding code is valid.

Target Bitrate Range and Default Values

The target bitrate of the encoded video stream can be set by the user within the accepted range: 8 to 100 Mbps for standard definition, 40 to 250 Mbps for high definition with the exception of Apple ProRes, Avid DNxHD® and DVCPro codecs working with defined bitrates.

The default values are M-JPEG 30 Mbps for standard definition and M-JPEG 100 Mbps for high definition.

Content Transfer Encoding and File Header

It is possible to perform the encoding process in 8-bit or 10-bit and to write a 10-bit file on selected codecs.

The following table summarizes the proposed configurations:

Codec	Encoding	File Header
DNxHD 120/145	8-bit	8-bit
DNxHD 185/220	8-bit	8-bit
DNxHD 185x **DNxHD 220x**	10-bit	10-bit
ProRes 120/145	8-bit	10-bit
ProRes 185/220	8-bit or 10-bit	10-bit
DVCPro HD	8-bit	8-bit
M-JPEG	8-bit	8-bit
MPEG	8-bit	8-bit
AVC-Intra 100	10-bit	10-bit

Note

When encoding in 10-bit, it is not possible to use the graphic functionality: Paint, Target, Logo Insertion, and manual offside line.

4.3.2. Maximum bitrates

These maximum values are valid for XS servers running Multicam version 11.00 or 11.01. They guarantee a smooth play and a browse at 100% speed on all channels simultaneously.

Codec	Format	2 ch	4 ch	4ch (3D)	6 ch	6ch (1080p)
SD JPEG	PAL	100	100	N/A	100	N/A
	NTSC	100	100	N/A	100	N/A
HD JPEG	PAL	225	225	180	180	180
	NTSC	250	250	180	180	180
HD MPEG	PAL	225	225	180	180	180
	NTSC	250	250	180	180	180
Avid DNxHD®	PAL	185	185	185	185	120
	NTSC	220	220	220	220	145
Apple ProRes 422	PAL	185	185	185	185	120
	NTSC	220	220	220	220	145
DVCPro 50	PAL	50	50	N/A	50	N/A
	NTSC	50	50	N/A	50	N/A
DVCPro HD	PAL	100	100	100	100	100
	NTSC	100	100	100	100	100
AVC-Intra 100	PAL	111	111	110	111	110
	NTSC	111	111	110	111	110

4.3.3. Interpolation

Introduction

The playing back of smooth slow motion pictures carries specific issues: since some fields must be repeated at regular interval to provide the video at the playback speed required by the operator, parity violation appears regularly on the output video signal. This issue is specific to interlaced formats (525i, 625i and 1080i) and does not concern progressive formats (720p and 1080p).

If O and E represent respectively the odd and even fields of a standard video signal (50/60 Hz), we have:

The original video signal:

- O E O E O E O E O E O E O E

The output video signal at 50% speed:

- O **O** **E** E O **O** **E** E O **O** **E** E O **O** **E** E

The output video signal at 33% speed:

- O **O** O E **E** E O **O** O E **E** E O **O** O E

The output video signal at 25% speed :

- O **O** O **O** **E** E **E** E O **O** O **O** **E** E **E** E

Fields with parity violation are shown in bold, underlined letters. As it appears from the above table, whatever the playback speed (with the exception of the normal 100% playback speed), a number of fields violate the normal parity of the output signal. This parity violation induces a 1-line shift of the field, resulting in a vertical jitter of the picture. The jitter frequency depends upon the chosen playback speed.

To avoid this phenomenon and provide a stable output picture, EVS developed 2 types of line interpolator: 2-line and 4-line interpolators. The interpolation process can be enabled or disabled by the operator on all EVS slow motion systems.

2-Line Interpolator

The 2-line interpolator actually generates a new field, when the original field is in parity violation. Each line of this new field is calculated by a weighted average of the 2 neighboring lines. This process solves the problem of parity violation and vertical jitter, but the drawback is a reduction of the vertical resolution on the interpolated fields, that appear unfocused. Another side effect is the alternation of original fields (perfectly focused) and interpolated fields (unfocused), resulting in a "pumping" video signal.

4-Line Interpolator

The 4-line interpolator uses a more sophisticated calculation based on the 4 neighboring lines. By using suitable coefficients for the weight of each line in the resulting calculation, we apply this interpolation to all fields. The final result is a permanently, slightly unfocused picture. The advantage is a stable output signal with no jitter and no "pumping", but the vertical bandwidth is even more reduced.

The interpolator is of course always disabled at 100% playback speed, because there is no parity violation.

EVS uses the same techniques with the Super Slow Motion disk recorder, working with all models of Super Motion cameras (150/180 Hz). The only difference between the processing of Super Motion and normal scan (50/60 Hz) signals is that the interpolator is always disabled at 33% playback speed, because the Super Motion signal does not cause parity violation at this particular speed.

Whatever the choice, the resulting picture is thus always a compromise between stability and resolution. With EVS systems, the operator always has the choice between any of the 3 above described techniques: no interpolation, 2-line interpolation or 4-line

interpolation. Even if the operator chooses to use the interpolation, this process will be automatically disabled when not necessary (100% playback for 50/60 Hz signal, 33% and 100% playback for 150/180 Hz signal).

Note

All professional VTRs use line interpolation in PlayVar mode to avoid vertical jitters.

Default value is interpolator off for all configurations except SuperLSM configuration in which 4-line interpolator mode is enabled.

4.4. AVID DNxHD ® and APPLE ProRes 422

4.4.1. Introduction

XS servers feature a native implementation of the Avid DNxHD® and Apple ProRes 422 high definition video codecs. This enables native audio and video file transfers in either direction between the XS servers, and Avid and Apple post-production tools in High Definition. This document explains the impact of using Avid DNxHD® and Apple ProRes codecs on XS servers, on the XNet2 SDTI network and on the XF2 in terms of storage capacity, number of usable video channels and network transfers.

For details on how to setup a direct connection between an HD XS server and an Avid or Apple server, please refer to the specific documents (EVS_AvidTM_integration_v3.01 or EVS_Apple_integration_v.3.01).

4.4.2. Video Bitrate Compatibility

Avid DNxHD® is standardized at specific bitrates according to 2 profiles:

- Standard profile: 120 Mbps in “PAL” (50 Hz) and 145 Mbps in “NTSC” (59.94 Hz)
- High Level profile: 185 Mbps in “PAL” (50 Hz) and 220 Mbps in “NTSC” (59.94 Hz)

Although Avid DNxHD® is standardized at the specific bitrates mentioned here above, Avid products can seamlessly read DNxHD® files and streams at other bitrates. DNxHD® pictures at other bitrates than those defined by the 2 official Avid profiles can also be referred to as “VC-3” as defined in SMPTE 1019.

To allow users to determine the best balance between picture quality, storage capacity, number of video channels per server, and network speed, XS servers can generate Avid DNxHD® files and streams at any given bitrate between 20 Mbps and 220 Mbps. These files and streams should remain compatible with Avid production tools.

Apple ProRes 422 is also standardized at specific bitrates according to 3 profiles:

1. Apple ProRes 422 (also sometimes referred to as Apple ProRes 422 SQ): 120 Mbps in “PAL” (50 Hz) and 145 Mbps in “NTSC” (59.94 Hz)
2. Apple ProRes 422 HQ: 185 Mbps in “PAL” (50 Hz) and 220 Mbps in “NTSC” (59.94 Hz)
3. Apple ProRes 422 LT: 85 Mbps in “PAL” (50 Hz) and 102 Mbps in “NTSC” (59.94 Hz)

Apple ProRes 422 on XS servers is only available at these bitrates.

4.4.3. Choice of Bitrate

How to Read the Following Tables?

1. Video Bitrate: value set by the user in the advanced parameters window of the XS server
2. Fields/Block: numbers of video fields that can be stored in one disk block of 8 MB, taking into account 8 audio tracks.
3. Actual Bandwidth: this is the actual disk/network bandwidth that is required for the real time record or real time playback of one video stream and its associated audio tracks.
4. Max. RT Channels: this is the maximum number of video channels (real time record or real time playback) that one XS server can support for a given frame rate and bitrate. Since an XS server can have a maximum of 6 local video channels, any value higher than 6 means that these additional real time access can be used over the XNet2 SDTI network.

   For mixed configuration with standard and super motion channels on the same server, the following rule must be used to ensure that the settings do not exceed the maximum bandwidth of the server : (nbr of standard channels x their actual bandwidth) + (nbr of super motion channels x their actual bandwidth) must be lower than or equal to 250 MB/s.

   Example: Can I run an XS server with 2 records (1 super motion + 1 standard) + 2 play (1 super motion + 1 standard) in Avid DNxHD® with a video bitrate of 100 Mbps in “PAL” ?

   Calculation: 1 standard rec/play at 100 Mbps uses 13.3 MB/s ; 1 super motion record/play at 100 Mbps uses 40.0 MB/s; 2 x 13.3 + 2 x 40.0 = 126.6 MB/s.

   Conclusion: this configuration is supported.
5. Network transfers: the maximum bandwidth over the XNet2 SDTI network is approximately 110 MB/s. To determine the number of real time transfers that can occur simultaneously over the network, this number must be divided by the actual bandwidth given in the table for a selected bitrate.

   Example: How many real time transfers can I do over an XNet2 SDTI network (set at 1485 Mbps) if I work with Apple ProRes 422 at 145 Mbps in “NTSC” ?

   Calculation:

   Maximum SDTI bandwidth / Actual Bandwidth = real time transfers:

   110 MB/s / 18.4 MB/s = 6 real time transfers.

   Note: This number is the maximum that the network connection can support. Of course it is also necessary that the XS where the material is stored has enough local disk bandwidth to feed the network accesses, on top of its own local channels (see Max. RT Channels)

To get information on the recording capacity of the servers according to the video bitrates, refer to section "Recording Capacities" on page 27

Avid DNxHD® & Apple ProRes 422 at 50 Hz (“PAL”)

Codec	Video Bitrate	Fields /Block	Actual Bandwidth	Max. RT Channels	XF2 Storage Capacity (in hours and minutes)			
					250 GB	500 GB	750 GB	1 TB
Avid DNxHD® Pro Res LT	85 Mbps	35	11.43 MB/s	21.87	5.36	11.24	17.11	22.48
Avid DNxHD®	100 Mbps	30	13.33 MB/s	18.75	4.48	9.46	14.44	19.32
Avid DNxHD® Apple ProRes 422	120 Mbps	26	15.38 MB/s	16.25	4.09	8.28	12.46	16.56
Avid DNxHD® Apple ProRes 422 HQ	185 Mbps	17	23.53 MB/s	10.62	2.43	5.32	8.21	11.04

Avid DNxHD® & Apple ProRes 422 at 150 Hz (“PAL Super Motion 3x”)

Codec	Video Bitrate	Fields /Block	Actual Bandwidth	Max. RT Channels	XF2 Storage Capacity (in hours and minutes)			
					250 GB	500 GB	750 GB	1 TB
Avid DNxHD® Pro Res LT	85 Mbps	12	33.33 MB/s	7.50	1.55	3.54	5.53	7.48
Avid DNxHD®	100 Mbps	10	40.00 MB/s	6.25	1.36	3.15	4.54	6.30
Avid DNxHD® Apple ProRes 422	120 Mbps	9	44.44 MB/s	5.63	1.26	2.56	4.25	5.52
Avid DNxHD® Apple ProRes 422 HQ	185 Mbps	5	66.67 MB/s	3.75	0.57	1.57	2.57	3.54

Avid DNxHD® & Apple ProRes 422 at 59.94 Hz (“NTSC”)

Codec	Video Bitrate	Fields /Block	Actual Bandwidth	Max. RT Channels	XF2 Storage Capacity (in hours and minutes)			
					250 G-B	500 G-B	750 G-B	1 TB
Avid DNxHD®	85 Mbps	42	11.42 MB/s	21.89	5.36	11.24	17.12	22.4-8
Avid DNxHD® Pro Res LT	100 Mbps	36	13.32 MB/s	18.77	4.48	9.47	14.45	19.3-4
Avid DNxHD® Apple ProRes 422	145 Mbps	26	18.44 MB/s	13.56	3.28	7.03	10.39	14.0-6
Avid DNxHD® Apple ProRes 422 HQ	220 Mbps	17	28.21 MB/s	8.86	2.16	4.37	6.57	9.14

Avid DNxHD® & Apple ProRes 422 at 180 Hz (“NTSC Super Motion 3x”)

Codec	Video Bitrate	Fields /Block	Actual Bandwidth	Max. RT Channels	XF2 Storage Capacity (in hours and minutes)			
					250 G-B	500 G-B	750 G-B	1 T-B
Avid DNxHD®	85 Mbps	15	31.97 MB/s	7.82	2.00	4.04	6.09	8.08
Avid DNxHD® Pro Res LT	100 Mbps	12	39.96 MB/s	6.26	1.36	3.15	4.55	6.30
Avid DNxHD® Apple ProRes 422	145 Mbps	9	53.28 MB/s	4.69	1.12	2.26	3.41	4.52
Avid DNxHD® Apple ProRes 422 HQ	220 Mbps	6	79.92 MB/s	3.13	0.48	1.38	2.27	3.16

4.4.4. XF2 Transfers

XF2 bandwidth for backup is 50 MB/s and 32 MB/s for restore.

Therefore, it can support in backup mode:

- 4.0 real time transfers with Avid DNxHD® 85 Mbps
- 3.5 real time transfers with Avid DNxHD® 100 Mbps
- 3.0 real time transfers with Avid DNxHD® or Apple ProRes 422 at 120 Mbps (PAL)
- 2.5 real time transfers with Avid DNxHD® or Apple ProRes 422 at 145 Mbps (NTSC)

Therefore it can support in restore mode:

- 2.8 real time transfers with Avid DNxHD® 85 Mbps
- 2.4 real time transfers with Avid DNxHD® 100 Mbps
- 2.0 real time transfers with Avid DNxHD® or Apple ProRes 422 at 120 Mbps (PAL)
- 1.7 real time transfers with Avid DNxHD® or Apple ProRes 422 at 145 Mbps (NTSC)

4.4.5. Gigabit Ethernet Transfers

Tip

The following observations focus on steady rates; the transfer performances with small clips will be lower as they generate a lot of starts and ends of sessions.

Backup

Maximum transfer speeds through the Gigabit ports of the XS server:

- 6 simultaneous real time transfers with Avid DNxHD® 85 Mbps
- 6.2 x faster than real time on a single transfers with Avid DNxHD® 85 Mbps
- 6 simultaneous real time transfers with Avid DNxHD® 100 Mbps
- 5.3 x faster than real time on a single transfers with Avid DNxHD® 100 Mbps
- 5.8 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 120 Mbps (PAL)
- 4.6 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 120 Mbps (PAL)
- 4.8 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 145 Mbps (NTSC)
- 3.8 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 145 Mbps (NTSC)

Restore

Maximum transfer speeds through the Gigabit ports of the XS server:

- 6 simultaneous real time transfers with Avid DNxHD® 85 Mbps
- 4 x faster than real time on a single transfers with Avid DNxHD® 85 Mbps
- 5.7 simultaneous real time transfers with Avid DNxHD® 100 Mbps
- 3.4 x faster than real time on a single transfers with Avid DNxHD® 100 Mbps
- 5 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 120 Mbps (PAL)
- 3 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 120 Mbps (PAL)
- 4.1 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 145 Mbps (NTSC)
- 2.5 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 145 Mbps (NTSC)

Simultaneous backup and restore

The backup sessions reach higher bandwidth and pre-empt the bandwidth against the restore sessions. On a ‘per session’ based, the system allocate between 3.75 and 6 times more bandwidth to backup session than to restore session.

4.4.6. Important Recommendations

- For 6-channel configuration, maximum bitrates for Avid DNxHD® or Apple ProRes 422 should be 220 Mbps (NTSC) or 185 Mbps (PAL).
- “Super Motion + 1 Cam” configuration (i.e. 1 Super Motion REC + 1 Std REC + 1 Super Motion PLAY + 1 Std PLAY): maximum bitrates for Avid DNxHD® or Apple ProRes 422 should be 145 Mbps (NTSC) or 185 Mbps (PAL).
- When using the Avid DNxHD® codec, we advise to work at 100 Mbps if the picture quality is satisfactory à the XS can sustain 6 local channels + 5 network transfers.
- The 4ch configurations with 3D, 1080p or 3D SLSM 3x are only possible with Avid DNxHD® 100 Mbps or Apple ProRes 422 LT.

4.5. Recording Capacities

Disk Storage

The disk storage, on SAS disks, can be as follows, with a total of up to 84 disks:

- internal storage only: 6 or 12 x 300 GB or 900 GB SAS disks
- external storage only: up to 4 arrays with 24 x 300 GB or 900 GB SAS disks, with or without spare disks
- both internal and external storage.

Warning
The sum of internal and external disk storage on an XS server cannot exceed 20 TB.

Raid Level: 3

The Video Raid uses striping process across 5 or 6 disk drives. The video and audio data is striped over the first 4 or 5 drives while the parity information is saved on the fifth or sixth drive.

If one drive is damaged, the Video Raid can use the parity information to recover the missing information, so that operation can continue seamlessly without bandwidth loss.

Recording Capacity Figures

The following tables show the recording capacity, in hours, for different video bitrates for:

- 1 record channel, that is 1 video + 4 stereo audio tracks in SD; 1 video + 8 stereo audio tracks in HD.
- With the Operational Disk Size parameter set to 100%.
- With arrays of 300 GB disks.

Tip
The table figures should be multiplied by 3 for 900 GB disk arrays.

Recording Capacity in Hours for 5 Disks (4+1) RAID Configuration - 50Hz

# Disks	# Ext arr-ay	(4+1)								
		# RAID-S	# Spar-es	30Mb-ps	40Mb-ps	50Mb-ps	100Mb-ps	110Mb-ps	120Mb-ps	185Mb-ps
				4 audio-s	4 audio-s	4 audio-s	8 audios	8 audios	8 audios	8 audios
5	1	1	0	75	58	48	23	22	19	13
6	1	1	1	75	58	48	23	22	19	13
10	1	2	0	152	117	96	47	44	39	26
11	1	2	1	152	117	96	47	44	39	26
15	1	3	0	228	176	145	71	66	59	40
16	1	3	1	228	176	145	71	66	59	40
20	1	4	0	304	234	193	95	88	79	53
21	1	4	1	304	234	193	95	88	79	53
25	2	5	0	380	293	242	119	111	99	67
27	2	5	2	380	293	242	119	111	99	67
30	2	6	0	457	352	290	142	133	119	80
32	2	6	2	457	352	290	142	133	119	80
35	2	7	0	533	411	339	166	155	138	94
37	2	7	2	533	411	339	166	155	138	94
40	2	8	0	609	470	387	190	177	158	107
42	2	8	2	609	470	387	190	177	158	107
45	2	9	0	686	528	435	214	200	178	121
47	2	9	2	686	528	435	214	200	178	121
50	3	10	0	762	587	484	238	222	198	135
53	3	10	3	762	587	484	238	222	198	135
55	3	11	0	838	646	532	262	244	218	148
58	3	11	3	838	646	532	262	244	218	148
60	3	12	0	914	705	581	285	266	238	162
63	3	12	3	914	705	581	285	266	238	162
65	3	13	0	991	764	629	309	289	258	175
68	3	13	3	991	764	629	309	289	258	175
70	3	14	0	1067	822	678	333	311	278	189

# Disks	# Ext arr-ay	(4+1)								
		# RAID-S	# Spar-es	30Mb-ps	40Mb-ps	50Mb-ps	100Mb-ps	110Mb-ps	120Mb-ps	185Mb-ps
				4 audio-s	4 audio-s	4 audio-s	8 audios	8 audios	8 audios	8 audios
74	4	14	4	1067	822	678	333	311	278	189
75	4	15	0	1143	881	726	357	333	297	202
79	4	15	4	1143	881	726	357	333	297	202
80	4	16	0	1220	940	775	381	355	317	216
84	4	16	4	1220	940	775	381	355	317	216

Recording Capacity in Hours for 6 Disk (5+1) RAID Configuration - 50Hz

# Disks	# Ext array	(5+1)								
		# RAIDS	# Spares	30Mbps	40Mbps	50Mbps	100Mbps	110Mbps	120Mbps	185Mbps
				4 audios	4 audios	4 audios	8 audios	8 audios	8 audios	8 audios
6	1	1	0	94	73	60	29	27	24	16
7	1	1	1	94	73	60	29	27	24	16
12	1	2	0	190	146	120	59	55	49	33
13	1	2	1	190	146	120	59	55	49	33
18	1	3	0	285	220	181	89	83	74	50
19	1	3	1	285	220	181	89	83	74	50
24	1	4	0	380	293	242	119	111	99	67
26	2	4	2	380	293	242	119	111	99	67
30	2	5	0	476	367	302	148	138	124	84
32	2	5	2	476	367	302	148	138	124	84
36	2	6	0	571	440	363	178	166	148	101
38	2	6	2	571	440	363	178	166	148	101
42	2	7	0	667	514	423	208	194	173	118
44	2	7	2	667	514	423	208	194	173	118
48	2	8	0	762	587	484	238	222	198	135
51	3	8	3	762	587	484	238	222	198	135
54	3	9	0	857	661	545	268	250	223	151
57	3	9	3	857	661	545	268	250	223	151
60	3	10	0	953	734	605	297	277	248	168
63	3	10	3	953	734	605	297	277	248	168
66	3	11	0	1048	808	666	327	305	273	185
69	3	11	3	1048	808	666	327	305	273	185
72	3	12	0	1143	881	726	357	333	297	202
76	4	12	4	1143	881	726	357	333	297	202
78	4	13	0	1220	940	775	381	355	317	216
82	4	13	4	1220	940	775	381	355	317	216

Recording Capacity in Hours for 5 Disk (4+1) RAID Configuration - 59.94Hz

# Disk-s	# Ext arra-y	(4+1)								
		# RAID-S	# Spar-es	30Mb-ps	40Mb-ps	50Mb-ps	100Mb-ps	110Mb-ps	145Mb-ps	220Mb-ps
				4 audio-s	4 audio-s	4 audio-s	8 audios	8 audios	8 audios	8 audios
5	1	1	0	75	58	48	23	21	16	11
6	1	1	1	75	58	48	23	21	16	11
10	1	2	0	151	117	96	47	43	33	22
11	1	2	1	151	117	96	47	43	33	22
15	1	3	0	228	176	144	71	65	49	33
16	1	3	1	228	176	144	71	65	49	33
20	1	4	0	304	235	193	95	87	66	45
21	1	4	1	304	235	193	95	87	66	45
25	2	5	0	380	294	241	119	109	82	56
27	2	5	2	380	294	241	119	109	82	56
30	2	6	0	456	353	290	143	131	99	67
32	2	6	2	456	353	290	143	131	99	67
35	2	7	0	533	412	338	166	152	115	78
37	2	7	2	533	412	338	166	152	115	78
40	2	8	0	609	471	386	190	174	132	90
42	2	8	2	609	471	386	190	174	132	90
45	2	9	0	685	530	435	214	196	149	101
47	2	9	2	685	530	435	214	196	149	101
50	3	10	0	761	589	483	238	218	165	112
53	3	10	3	761	589	483	238	218	165	112
55	3	11	0	838	648	531	262	240	182	123
58	3	11	3	838	648	531	262	240	182	123
60	3	12	0	914	707	580	286	262	198	135
63	3	12	3	914	707	580	286	262	198	135
65	3	13	0	990	766	628	310	284	215	146
68	3	13	3	990	766	628	310	284	215	146
70	3	14	0	1066	825	677	333	306	231	157

# Disk-s	# Ext arra-y	(4+1)								
		# RAID-S	# Spar-es	30Mb-ps	40Mb-ps	50Mb-ps	100Mb-ps	110Mb-ps	145Mb-ps	220Mb-ps
				4 audio-s	4 audio-s	4 audio-s	8 audios	8 audios	8 audios	8 audios
74	4	14	4	1066	825	677	333	306	231	157
75	4	15	0	1143	884	725	357	328	248	168
79	4	15	4	1143	884	725	357	328	248	168
80	4	16	0	1219	943	773	381	349	265	180
84	4	16	4	1219	943	773	381	349	265	180

Recording Capacity in Hours for 6 Disk (5+1) RAID Configuration - 59.94Hz

# Disk-s	# Ext arra-y	(5+1)								
		# RAID-S	# Spar-es	30Mb-ps	40Mb-ps	50Mb-ps	100Mb-ps	110Mb-ps	145Mb-ps	220Mb-ps
				4 audio-s	4 audio-s	4 audio-s	8 audios	8 audios	8 audios	8 audios
6	1	1	0	94	73	60	29	27	20	14
7	1	1	1	94	73	60	29	27	20	14
12	1	2	0	190	147	120	59	54	41	28
13	1	2	1	190	147	120	59	54	41	28
18	1	3	0	285	220	181	89	81	62	42
19	1	3	1	285	220	181	89	81	62	42
24	1	4	0	380	294	241	119	109	82	56
26	2	4	2	380	294	241	119	109	82	56
30	2	5	0	475	368	302	148	136	103	70
32	2	5	2	475	368	302	148	136	103	70
36	2	6	0	571	442	362	178	163	124	84
38	2	6	2	571	442	362	178	163	124	84
42	2	7	0	666	515	423	208	191	144	98
44	2	7	2	666	515	423	208	191	144	98
48	2	8	0	761	589	483	238	218	165	112
51	3	8	3	761	589	483	238	218	165	112
54	3	9	0	857	663	544	268	245	186	126
57	3	9	3	857	663	544	268	245	186	126
60	3	10	0	952	737	604	298	273	207	140
63	3	10	3	952	737	604	298	273	207	140
66	3	11	0	1047	810	665	327	300	227	154
69	3	11	3	1047	810	665	327	300	227	154
72	3	12	0	1143	884	725	357	328	248	168
76	4	12	4	1143	884	725	357	328	248	168
78	4	13	0	1219	943	773	381	349	265	180
82	4	13	4	1219	943	773	381	349	265	180

5. Hardware Installation and Cabling

5.1. Rack Installation

5.1.1. Unpacking

Upon receipt of the equipment examine packing for obvious signs of damage. If damaged, do not unpack and inform the carrier immediately. Check thanks to the included packing list if all the items are present and if they show any mechanical damage. If yes, report damage or the missing parts to EVS or their appropriate representative.

5.1.2. Ventilation and Rack Mounting

Adequate ventilation is obviously required for optimum performance. As a result of this consideration, ensure that no other equipment is located close to the mainframe.

Warning

- Remember that fans are used to air cool the equipment and protect it from overheating.
- Do not block fans intakes during operations.

Having regard to the weight of the server chassis, support guides are required for this unit into the rack mount. The front ears of the unit are not designed to support its full weight. Applying full weight on these might result in bending the metal plate.

5.1.3. Boards Checking

The main power switch is located at the front side (lower right corner) of the unit.

Before turning on the power, open the front door of Video disk recorder unit to check if all boards fit into their guides. If a board is out of its guides, remove carefully the board and replace it in the same slot.

5.2. Rear Panel Description

5.2.1. Rear Panel Configurations

The XS server comes in a variety of configurations and rear panel variants:

- 6U rack with 6, 4 or 2 channels and various audio connectors.
- 5U rack with 4 or 2 channels and various audio connectors.

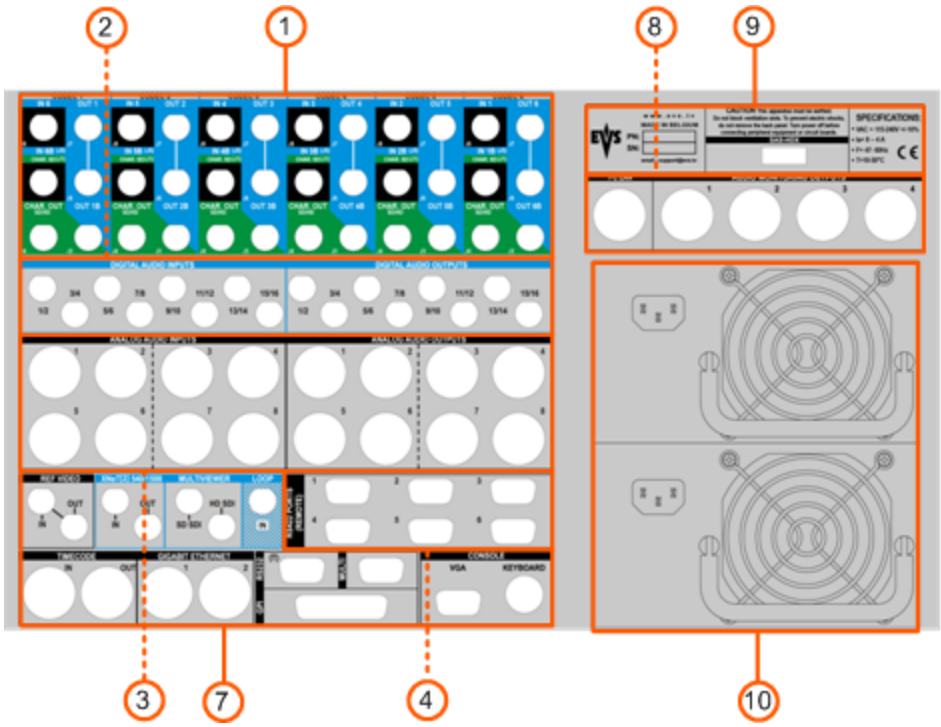
The different available configurations and the connectors positions and types for each of these variants are described in the following topics.

5.2.2. 6U Rear Panel Layout

Rear Panel Areas

The following drawing represents an example of a 6U rear panel available on an XS server.

The various areas of the rear panel are highlighted in the drawing and their respective variants are listed in the following table along with a short description of the related connectors.

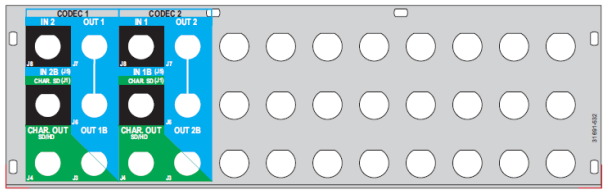
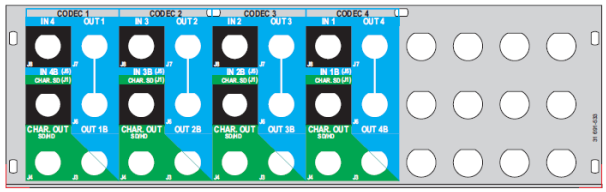
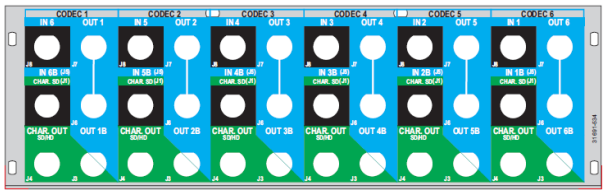


Video and Codecs ①

The codecs modules allow connections for recording and playback of video material. Each connector on a codec module is connected to the corresponding J connector on the COD A or COD B module of a V3X board.

See section "V3X Video and Reference Boards" on page 68 for more details on each connector specific usage according to the different configurations.

The following video and codecs connectors layouts are available according to your configuration:

Config	Layout	Description
222		2 channels version
444		4 channels version
666		6 channels version

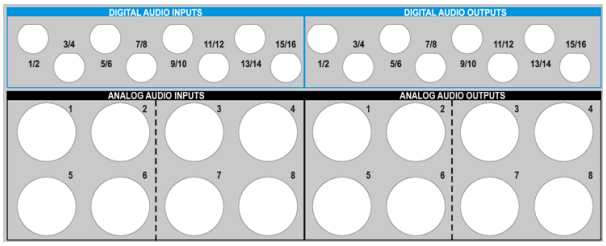
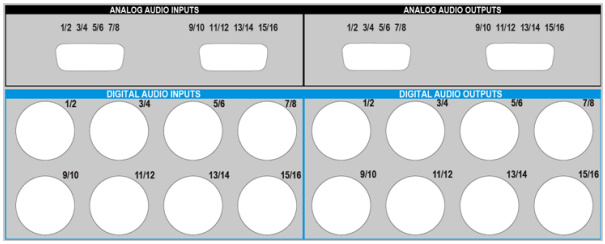
Analog and Digital Audio ②③

This section shows the available associations of analog and digital connectors.

See section "Audio Specifications" on page 16 for more details on the available audio configurations.

See section "Audio Connections" on page 45 for more details on the DA-15 connectors pinout depending on the configuration.

The following analog and digital audio connectors layouts are available according to your configuration:

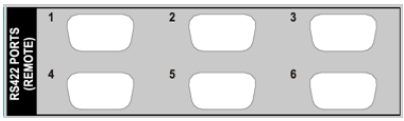
Config	Layout	Description
-		• Digital audio: 16 BNC connectors (8 in and 8 out) • Analog audio: 16 XLR connectors (8 in and 8 out) Not available on 2-channel XS 6U
-		• Analog audio: 4 multi-pin DA-15 connectors (2 in and 2 out) • Digital audio: 16 XLR connectors (8 in and 8 out) Not available on 2-channel XS 6U

RS422 Ports ④

The RS422 ports allow the server to be remotely controlled through remote panels or third-party control devices.

In Spotbox mode, the remote panel, if used, should be connected on the first RS422 port.

The RS422 connectors layout is as follows:

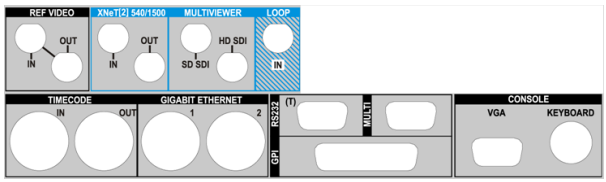
Config	Layout	Description
All		6 connectors

Controls and Communications ⑦

This rear panel part presents some or all of the following connectors according to your configuration:

- The **Ref Video** connectors allow the server to receive or send back the analog genlock reference signal.
- The **XNet2** connectors allow the interconnection of EVS servers, XF2, and/or XStore in an XNet2 network. The IN connector of a server is connected to the OUT connector of another server, and so on to form a closed loop network.
- The **Multiviewer** connectors allow a monitor to be connected directly to the server, and to display PGM and REC channels as configured in the Multicam Configuration window, in the Monitoring tab, Multiviewer page. See the Multicam Configuration manual for a description of the configuration parameters.
- The **Loop IN** connector allows the loop of PGM1 on REC1 to be able to use the loop feature.
- The **Timecode** connectors allow the server to receive or send back the LTC timecode reference signal.
- The **Gigabit Ethernet** connectors allow the interconnection of servers, other EVS, and/or third-party systems into a Gigabit Ethernet network.
- The **RS232** connector allows a tablet to be connected to the server.
- The **Multiviewer** connector provides an analog Multiviewer output on a DA-15 connectors, that can be configured in CVBS, RGB HD or YUV HD.
- The **GPI** connector allows GPI (General Purpose Interface) devices to send or receive electric pulses that will trigger commands on the server or to be connected with third-party devices.
- The **Console** connector allows a monitor and a keyboard to be connected to the server.

The following connectors layouts are available according to your configuration:

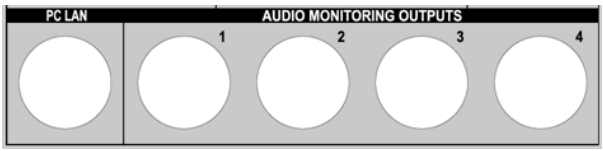
Config	Layout	Description
All		• Ref Video • XNet2 • Multiviewer • Loop IN • Timecode • Gigabit Ethernet • RS232 • Multiviewer • GPI • Console

Controls and Communications ⑧

This rear panel part presents some or all of the following connectors according to your configuration:

- The **PC LAN** connector is a XLR connector that enables the connection to the PC LAN network.
- The **Audio Monitoring Outputs** connectors are AES XLR connectors that allow audio output connections for monitoring purposes.

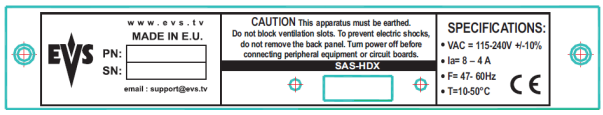
The following connectors layouts are available according to your configuration:

Config	Layout	Description
All		• PC LAN • Audio Monitoring Outputs

SAS-HDX ⑨

The SAS-HDX connector allows the connection to the external disk array SAS-HDX if it is installed.

The SAS-HDX connector layout is as follows:

Config	Layout	Description
All		SAS-HDX connector

Power Supplies ⑩

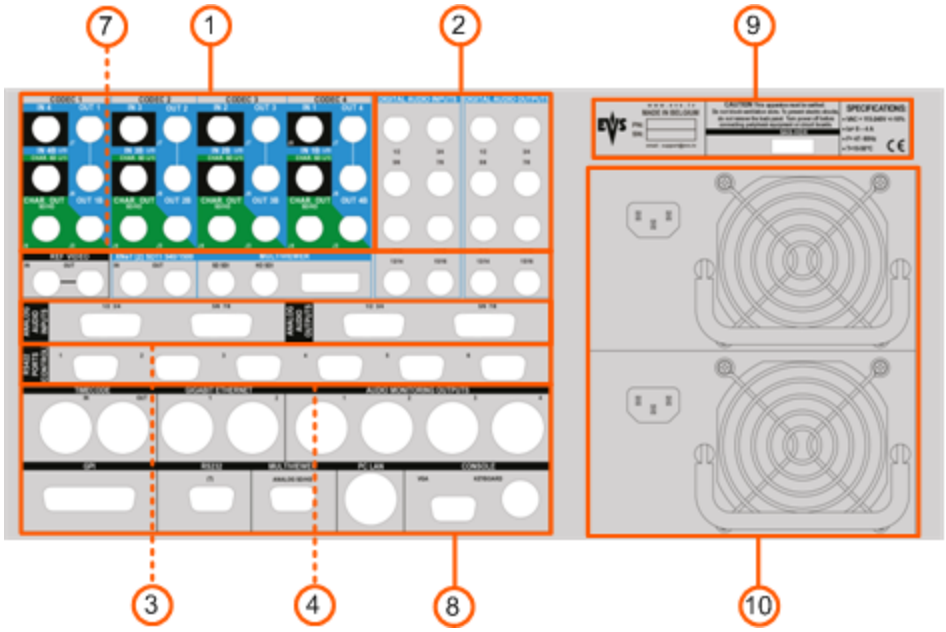
The server power supply is made of two hot-swappable units. Both of these units are connected to allow automatic power switching to the second power supply should the first one fail.

5.2.3. 5U Rear Panel Layout

Rear Panel Areas

The following drawing represents an example of a 5U rear panel available on an XS server.

The various areas of the rear panel are highlighted in the drawing and their respective variants are listed in the following table along with a short description of the related connectors.

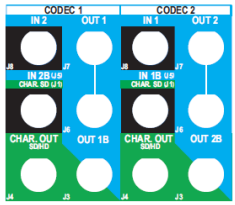
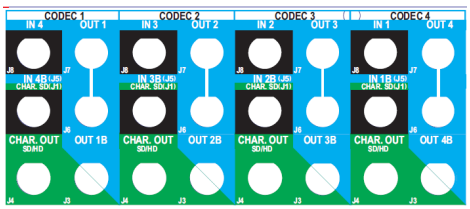
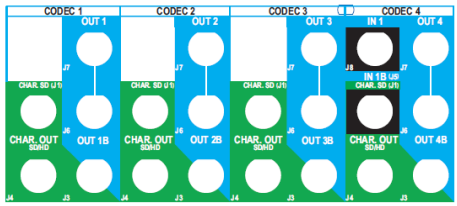
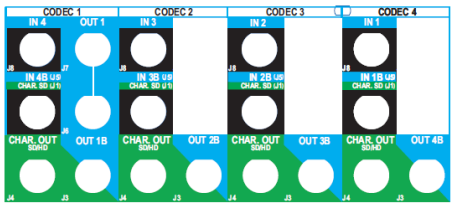


Video and Codecs ①

The codecs modules allow connections for recording and playback of video material. Each connector on a codec module is connected to the corresponding J connector on the COD A or COD B module of a V3X board.

See section "V3X Video and Reference Boards" on page 68 for more details on each connector specific usage according to the different configurations.

The following video and codecs connectors layouts are available according to your configuration:

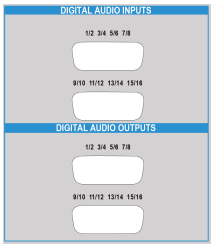
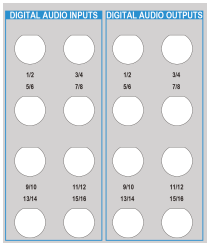
Config	Layout	Description
222		2 channels version
444		4 channels version (open configuration)
414		4 channels version (playout configuration)
441		4 channels version (ingest configuration)

Digital Audio ②

The digital audio inputs and outputs are available on multi-pin (DA-15), or on BNC connectors for audio signal inputs and outputs in digital format.

See section "Audio Connections" on page 45 for more details on the DA-15 connectors pinout according to the configuration.

The following digital audio connectors layouts are available according to your configuration:

Config	Layout	Description
DA-15		4 multi-pin DA-15 connectors, 2 for inputs and 2 for outputs
BNC		16 BNC connectors, 8 for inputs and 8 for outputs

Analog Audio ③

The analog audio inputs and outputs are available on multi-pin (DA-15) connectors for audio signal inputs and outputs in analog format.

See section "Audio Connections" on page 45 for more details on the DA-15 connectors pinout according to the configuration.

The analog audio connectors layout is as follows:

Config	Layout	Description
All		4 multi-pin DA-15 connectors, 2 for inputs and 2 for outputs

RS422 Ports ④

The RS422 ports allow the server to be remotely controlled through remote panels or third-party control devices.

In Spotbox mode, the remote panel, if used, should be connected on the first RS422 port.

The RS422 connectors layout is as follows:

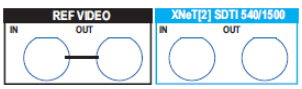
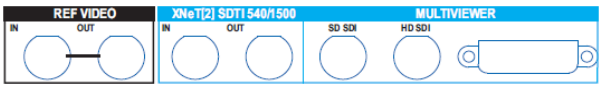
Config	Layout	Description
All		6 connectors

Controls and Communications ⑦

This rear panel part presents some or all of the following connectors according to your configuration:

- The **Ref Video** connectors allow the server to receive or send back the analog genlock reference signal.
- The **XNet2** connectors allow the interconnection of EVS servers, XF2, and/or XStore in an XNet2 network. The IN connector of a server is connected to the OUT connector of another server, and so on to form a closed loop network.
- The **Multiviewer** connectors allow a monitor to be connected directly to the server, and to display PGM and REC channels as configured in the Multicam Configuration window, in the Monitoring tab, Multiviewer page. See the Multicam Configuration manual for a description of the configuration parameters.

The following connectors layouts are available according to your configuration:

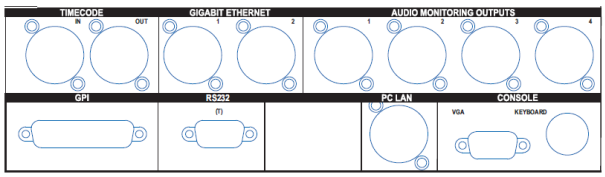
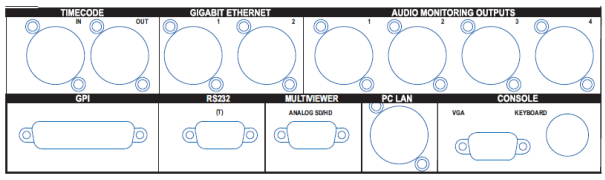
Config	Layout	Description
222		• Ref Video • XNet2
444 **414** **441**		• Ref Video • XNet2 • Multiviewer

Controls and Communications ⑧

This rear panel part presents some or all of the following connectors according to your configuration:

- The **Timecode** connectors allow the server to receive or send back the LTC timecode reference signal.
- The **Gigabit Ethernet** connectors allow the interconnection of servers, other EVS, and/or third-party systems into a Gigabit Ethernet network.
- The **Audio Monitoring Outputs** connectors are AES XLR connectors that allow audio output connections for monitoring purposes.
- The **GPI** connector allows GPI (General Purpose Interface) devices to send or receive electric pulses that will trigger commands on the server or to be connected with third-party devices.
- The **RS232** connector allows a tablet to be connected to the server.
- The **Multiviewer** connector provides an analog Multiviewer output on a DA-15 connectors, that can be configured in CVBS, RGB HD or YUV HD.
- The **PC LAN** connector is a XLR connector that enables the connection to the PC LAN network.
- The **Console** connector allows a monitor and a keyboard to be connected to the server.

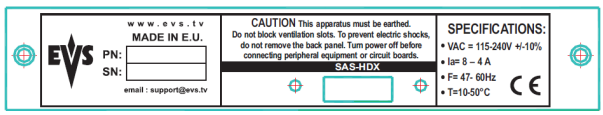
The following connectors layouts are available according to your configuration:

Config	Layout	Description
222		• Timecode • Gigabit Ethernet • Audio Monitoring Outputs • GPI • RS232 • PC LAN • Console
444 **414** **441**		• Timecode • Gigabit Ethernet • Audio Monitoring Outputs • GPI • RS232 • Multiviewer • PC LAN • Console

SAS-HDX ⑨

The SAS-HDX connector allows the connection to the external disk array SAS-HDX if it is installed.

The SAS-HDX connector layout is as follow:

Config	Layout	Description
All		SAS-HDX connector

Power Supplies ⑩

The server power supply is made of two hot-swappable units. Both of these units are connected to allow automatic power switching to the second power supply should the first one fail.

5.3. Video Connections

You fill find full details on video connections in the Configuration manual, Supported Configuration chapter.

5.4. Audio Connections

5.4.1. Audio Channels

The XS server manages up to 64 embedded audio channels, depending on the chosen variant and the installed hardware.

The embedded audio modules and codecs can be used as input or output channels for embedded, digital (AES/EBU), or analog audio signals.

Depending on your server configuration you can find the following audio connectors on the rear panel:

- Digital audio:
  - DA-15 connectors: 16 inputs and 16 outputs (110 Ohm balanced).
  - BNC connectors: 8 inputs and 8 outputs (75 Ohm unbalanced).
  - XLR connectors: 8 inputs and 8 outputs (110 Ohm balanced).

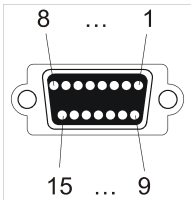
- Analog audio:
  - XLR connectors: 8 inputs (high-Z balanced) and 8 outputs (600 Ohm drive capable).
  - DA-15 connectors: 16 inputs (high-Z balanced) and 16 outputs (600 Ohm drive capable - breakout cables with XLR connectors available).
- Audio monitoring :
  - XLR connectors: 4 analog mono outputs (600 Ohm drive capable).

See also section "Audio Specifications" on page 16 for full information on the available audio hardware configurations.

The connectors are illustrated along with their respective pinouts in the following topics.

5.4.2. Digital Audio DA-15 Pinout

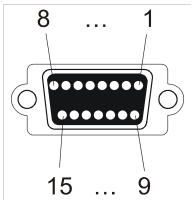
The digital audio DA-15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table where each column corresponds to one of the 4 available connectors.



Pin #	DA-15 connector #1 Inputs 1-8 (mono)	DA-15 connector #2 Inputs 9-16 (mono)	DA-15 connector #3 Outputs 1-8 (mono)	DA-15 connector #4 Outputs 9-16 (mono)
1	Gnd	Gnd	Gnd	Gnd
2	AES input 1/2 +	AES input 9/10 +	AES output 1/2 +	AES output 9/10 +
3	Gnd	Gnd	Gnd	Gnd
4	AES input 3/4 +	AES input 11/12 +	AES output 3/4 +	AES output 11/12 +
5	Gnd	Gnd	Gnd	Gnd
6	AES input 5/6 +	AES input 13/14 +	AES output 5/6 +	AES output 13/14 +
7	Gnd	Gnd	Gnd	Gnd
8	AES input 7/8 +	AES input 15/16 +	AES output 7/8 +	AES output 15/16 +
9	AES input 1/2 -	AES input 9/10 -	AES output 1/2 -	AES output 9/10 -
10	Gnd	Gnd	Gnd	Gnd
11	AES input 3/4 -	AES input 11/12 -	AES output 3/4 -	AES output 11/12 -
12	Gnd	Gnd	Gnd	Gnd
13	AES input 5/6 -	AES input 13/14 -	AES output 5/6 -	AES output 13/14 -
14	Gnd	Gnd	Gnd	Gnd
15	AES input 7/8 -	AES input 15/16 -	AES output 7/8 -	AES output 15/16 -

5.4.3. Analog Audio DA-15 Pinout

The analog audio DA-15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table where each column corresponds to one of the 4 available connectors.



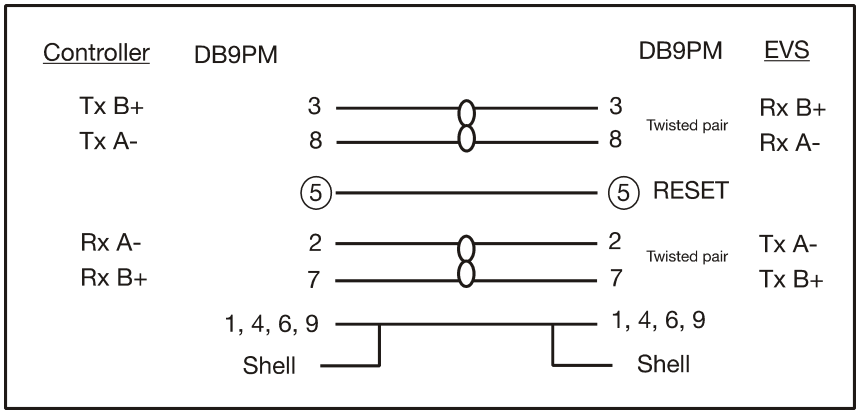
Pin #	DA-15 connector #1 Inputs 1-4 (mono)	DA-15 connector #2 Inputs 5-8 (mono)	DA-15 connector #3 Outputs 1-4 (mono)	DA-15 connector #4 Outputs 5-8 (mono)
1	Gnd	Gnd	Gnd	Gnd
2	Analog input 1 +	Analog input 5 +	Analog output 1 +	Analog output 5 +
3	Gnd	Gnd	Gnd	Gnd
4	Analog input 2 +	Analog input 6 +	Analog output 2 +	Analog output 6 +
5	Gnd	Gnd	Gnd	Gnd
6	Analog input 3 +	Analog input 7 +	Analog output 3 +	Analog output 7 +
7	Gnd	Gnd	Gnd	Gnd
8	Analog input 4 +	Analog input 8 +	Analog output 4 +	Analog output 8 +
9	Analog input 1 -	Analog input 5 -	Analog output 1 -	Analog output 5 -
10	Gnd	Gnd	Gnd	Gnd
11	Analog input 2 -	Analog input 6 -	Analog output 2 -	Analog output 6 -
12	Gnd	Gnd	Gnd	Gnd
13	Analog input 3 -	Analog input 7 -	Analog output 3 -	Analog output 7 -
14	Gnd	Gnd	Gnd	Gnd
15	Analog input 4 -	Analog input 8 -	Analog output 4 -	Analog output 8 -

5.5. RS422 Connections

5.5.1. RS422 Connector Pinout

The RS422 connectors are used to connect a remote control (from EVS or third party) to your server.

The cable wiring is a straightforward pin-to-pin connection as illustrated in the following diagram. You should use a shielded cable to avoid electromagnetic interference on long distances.



Warning

The RESET command line from the remote control is sent through the pin 5 of the RS422 connector. This function should be disabled when the controller on connector #1 is not an EVS controller.

The technical specification for the RS422 link is as follows:

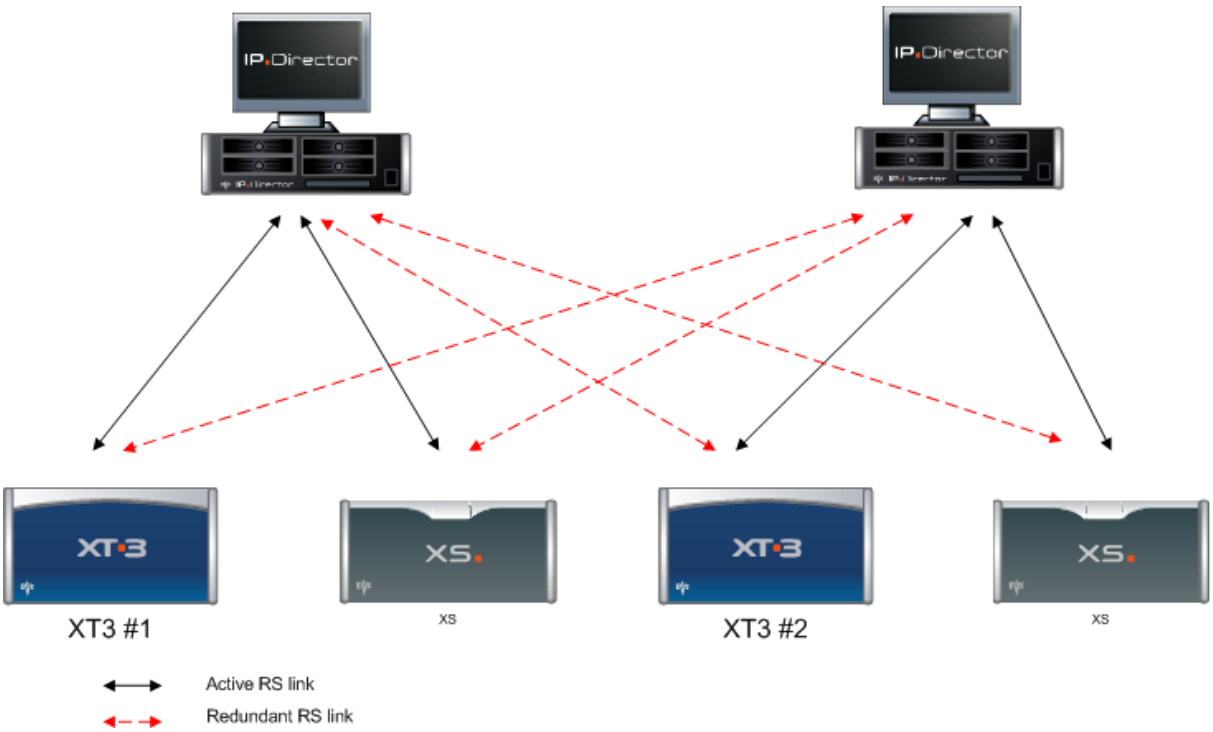
- 19200 bauds
- No parity
- 8 data bits
- 1 stop bit

5.5.2. Redundant IPDP Serial Link

The IPDirector communicates with the server via one serial link. If that link fails, the XS server can no longer be controlled by any IPDirector.

A failover mechanism has been put into place: it switches the IPDirector link from one port of an XS server to another port on another XS server.

To ensure the failover, the backup links between IPDirector workstations and the XS servers need to be physically wired to a second RS422 port, as shown on the following schema:



The serial link redundancy will ensure that there is no single point of failure in the setup. However, you need to put into place a thoroughly thought through IPDP configuration for the SynchroDB to continue working correctly. This can be achieved, for example, by defining an IPDirector workstation in Network mode.

5.6. XNet Network

5.6.1. Introduction

The XNet2 network is composed by several EVS video servers all connected with a 75-Ohm coaxial cable (BNC).

The exchange between systems is operated through the SDTI interface at 1485 Mbps.

On XS servers there is one pair of SDTI connectors: XNet2 Non-Relay connectors that can be used at 1485 Mbps.

The SDTI loop is closed only when the Multicam software is started. It is therefore recommended to use XHub when using Non-Relay connectors to avoid network interruptions.

The XNet2 requires a network server dedicated to the management of the Database shared among all LSM-EVS video servers. This is assigned to one of the LSM-EVS servers on the network. The EVS server acting as the network server can of course be used for standard LSM/video server operation.

Note

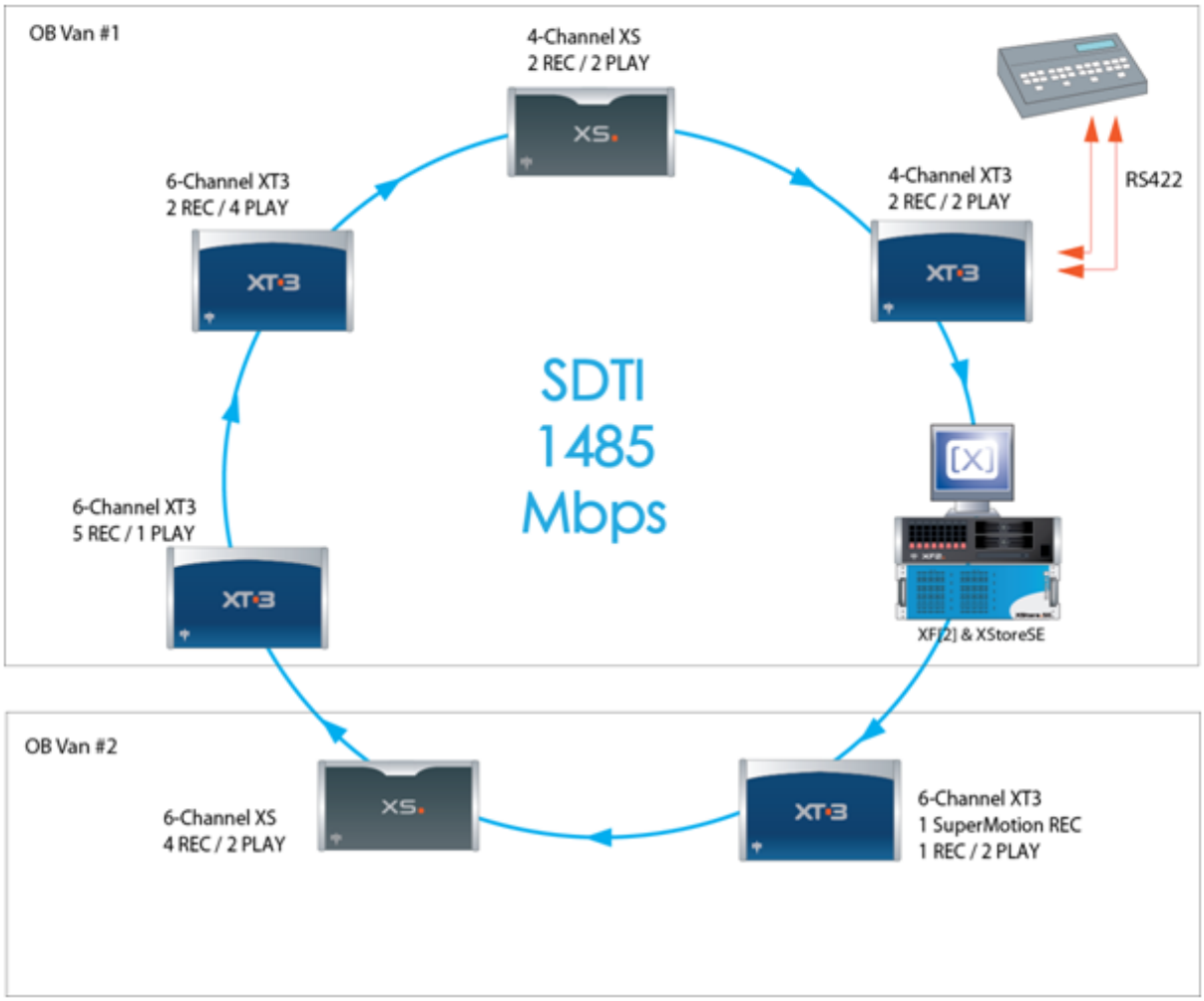
If an XS server must be connected to other XT or XS family servers, these servers must run at least Multicam version 10.05.

5.6.2. Network Architectures

To assemble an XNet2 network, EVS servers may be connected directly in a closed loop architecture or, using a dedicated hub, they may be connected in a star architecture as illustrated in the following figures.

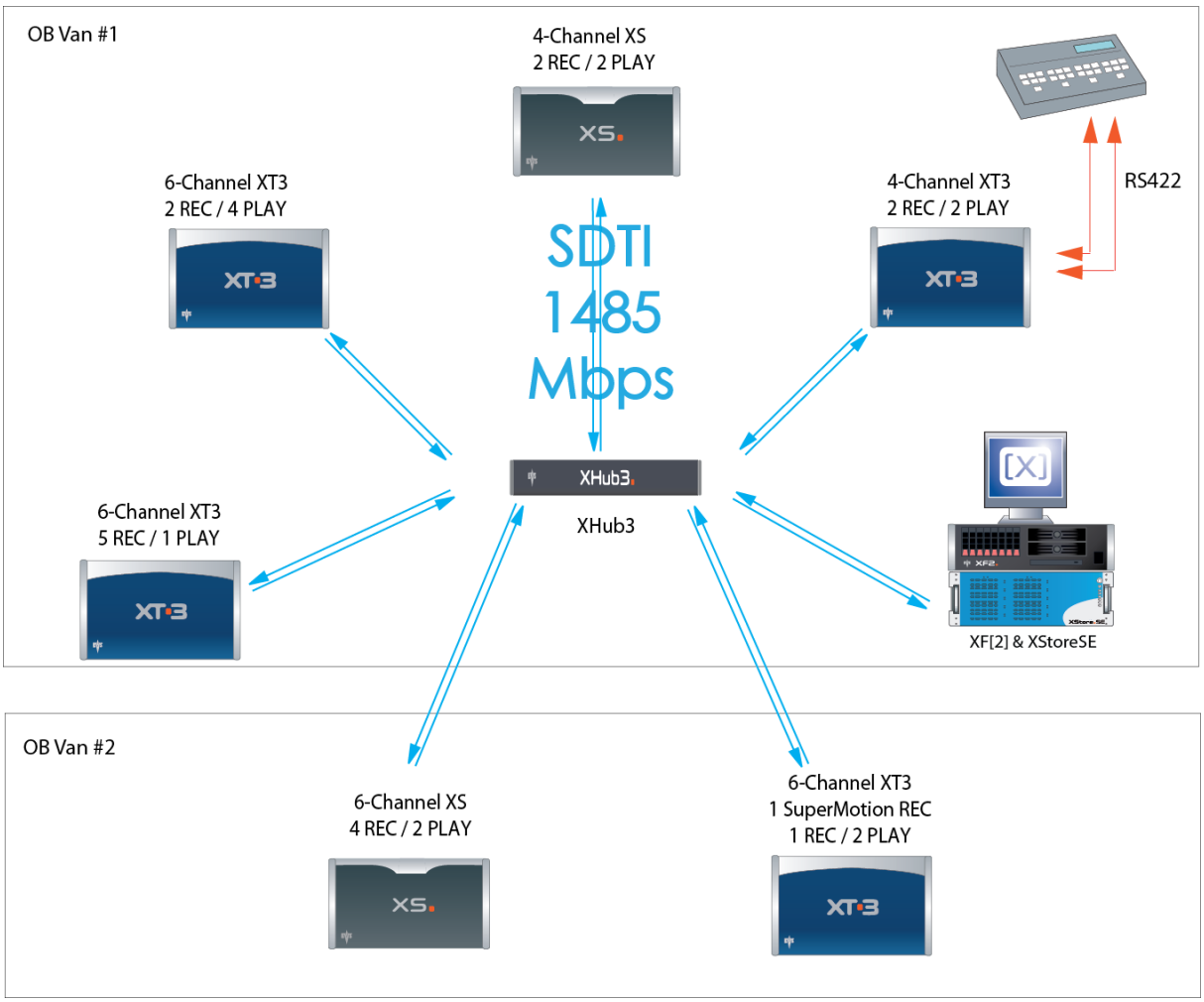
Connection Diagram Without EVS XHub SDTI Hub

Example of XNet2 network without hub:



Connection Diagram With EVS XHub SDTI Hub

Example of XNet2 network with a SDTI hub:



5.6.3. Required Conditions to Set up and Run XNet

1. All systems on the network must be XT2, XT2+, XT3 or XS family servers, and XF2, XStoreSE, XHub2, or XHub3 devices.
2. The SDTI advanced option code (for network client, master, or server modes) must be validated in the options list.
3. They should all be running compatible software version. A warning message is displayed when trying to connect an EVS video server with a software version that is not compatible with the network server.
4. The following parameters must be similar on all systems: SDTI speed (1485 Mbps in Hardware Configuration menu)
5. Network Type must be set to “Server” on one and only one EVS video server on the network. The others must be set to either “Master” (to share clips and view others clips) or “Client” (to share clips only).

6. A different network number must be specified for each EVS video server that you want to connect to the network. If the same network number is assigned to 2 different systems, the second one will not be able to connect and a warning message will be displayed.
7. All EVS video servers must be connected with a good quality BNC 75 Ohm cable to form a closed loop. Connect the SDTI OUT connector of the first EVS video server to the SDTI IN connector of the second one, etc until the loop is closed by connecting the SDTI OUT connector of the last EVS video server to the SDTI IN connector of the first one. The SDTI loop must be closed at all times during network operation. If for any reason the loop is open, all network communication will be interrupted and all systems will automatically switch to stand alone mode. When the loop is closed again, network operation will resume automatically. This problem can be avoided or limited using EVS XHub SDTI hub.
8. The distance shown in the table below is the maximum cable length between two active EVS servers, or 2 SDTI reclockers, on an XNet2 SDTI network, using a single piece of cable between 2 servers or 2 reclockers. Intermediate connectors, patch panels, etc., might degrade these figures. Depending on the number of servers connected on the network, the location of the master server, the presence or not of an XHub SDTI hub, the actual maximum values may be higher than indicated. If longer distances between servers are required, SDTI to Fiber converters can be used, allowing distances over thousands of meters if necessary. EVS has validated the following SDI-Fibre converters:
    - Stratos Lightwave Media Converter TX/RX VMC-T-H-2/VMC-R-H-2 (www.stratoslightwave.com)
    - Telecast TX/RX292 (www.telecast-fiber.com)
    - Network Electronics SDI-EO-13T (electrical to optical) / SDI-OE-S (optical to electrical) (www.network-electronics.com)
    - Network Electronics HD-EO-13T (electrical to optical) / HD-OE (optical to electrical)
    - BlueBell BB320T (TX) and BB320R (RX) (www.bluebell.tv)

Cable type	@ 1485 Mbps
RG59	45 m / 148 ft
RG6	90 m / 484 ft
RG11	120 m / 393 ft
Super HiQ	150 m / 492 ft
Fiber	80 km (*)

(*) 80 km/200 km is the total length of the return path, i.e. the actual distances between the 2 servers connected via the fiber link is half of this value, i.e. 40 km @ 1485 Mbps.

Note

When reclockers are used, the total delay induced by these reclockers between 2 active servers on the network may not exceed 15 µs.

5.6.4. Starting XNet

1. When all above conditions are fulfilled, turn on the “Server” EVS video server and start the Multicam application.
2. Turn on all “Masters” and “Clients” EVS video servers, and make sure the Multicam application is started on all of them.
3. They should see the “Server” on the network and they will connect automatically. Connection takes a few seconds (usually between 2 and 5 sec) for each EVS video server.

5.6.5. XNet Performances and Troubleshooting

1. With the default settings, 10 real-time transfers can be achieved on the network with standard definition pictures in normal conditions, and 3 real-time transfers with super motion pictures. Copy of a clip between 2 servers on the network can be made up to 5 times faster than real time, depending on network load.

   With high definition pictures, these numbers are reduced to 3-4 real-time transfers and copy clip 2 times faster than real time.

   These performances are also limited by the disk bandwidth available from the EVS server where the clips are stored. If the EVS server “owning” the clips is doing multiple playbacks at the same time, freezes can occur on the remote EVS server using those clips. Priority levels have been implemented to maximize network bandwidth efficiency: PLAY requests have a higher priority than SEARCH/BROWSE requests, which in turn have a higher priority than COPY requests. Note that “Live” (E2E) mode on a remote record train has the same priority level as a SEARCH/BROWSE request.
2. Note that when working at 1485 Mbps, only passive SDI routing equipment may be used. The use of active SDI equipment should be avoided, because they could cause additional line delays and prevent the proper operation of XNet2.
3. If the start-up of the network at a specific speed does not work properly and all machines are apparently configured properly and the Multicam is actually started on all of them, this can be due to the fact that the selected cables to connect all EVS servers together are not suitable or too long to operate at such a speed. You can decrease the speed of the SDTI network on all machines and try working in this mode. The number of simultaneous real-time transfers you can achieve is of course reduced.
4. While working at 1485 Mbps, if the connection cannot be established, please make sure that all equipments are set to the same speed and connected to the non-relay connectors. All equipments should be started if not connected to an XHub.
5. It is recommended to use XHub if the network speed is set to 1485 Mbps.
6. Once the network has been established, if the system acting as the network server is disconnected or shut down, another system will automatically be assigned to act as a new network server. The switch is automatic. The next machine to be automatically assigned as new network server is the one with the highest serial number in the SDTI network.

5.7. Gigabit Network

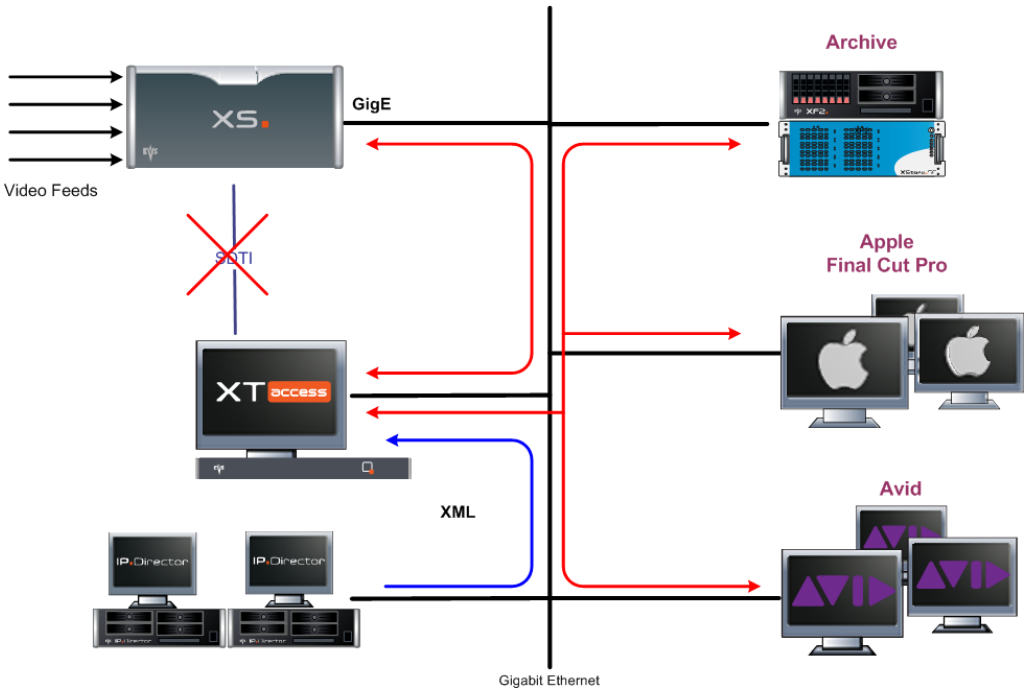
5.7.1. Functional Overview

The Gigabit connection makes it possible to transfer video and audio material from your XS server to external systems via the TCP/IP network.

The external systems can be the following:

- A storage system or an archiving system, such as XStore or XF2.
- A non-linear editing system, such as Xedio, Apple Final Cut Pro, or Avid.

However, the external systems cannot read the raw files coming from a XS server. For this reason, XTAccess is used as a “gateway” between your server and the IT world. It takes up the role of gateway used so far by XFile/XStream as it creates file formats compliant with external systems.



XTAccess is directly connected to the XS server through the Gigabit network via an FTP client. It runs on a Windows workstation and is mainly controlled by the external systems (no user interface) via XML files or other processes.

The Gigabit connection fulfills the following functions in relation with the XS server:

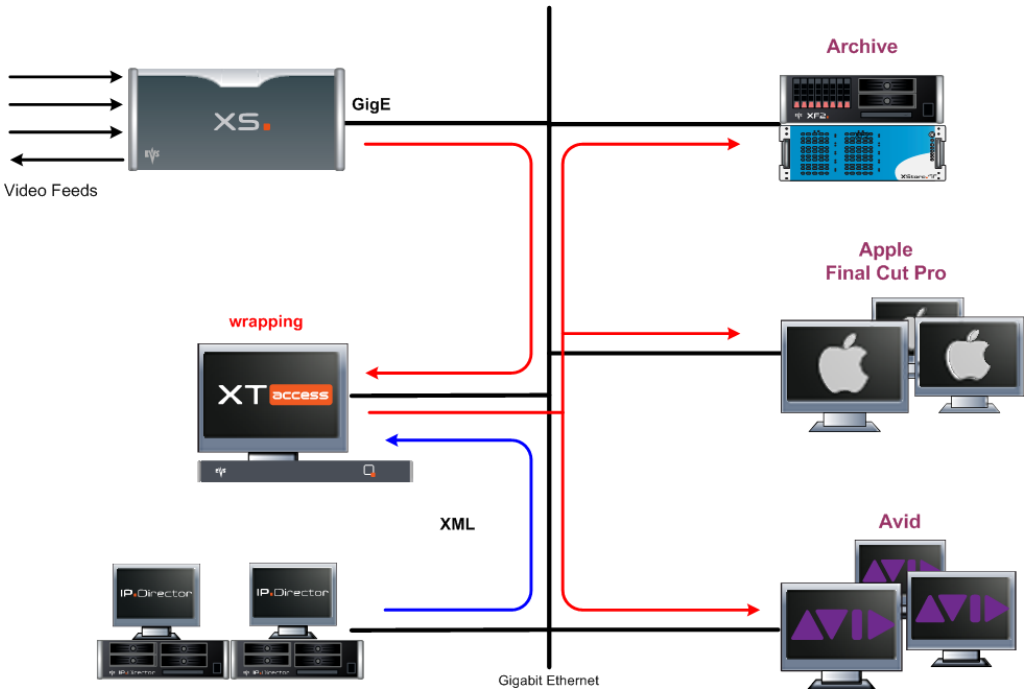
- Backup of clips from an XS server.
- Restore of clips to an XS server.
- Transfer of clips between servers.

Please refer to the XTAccess user manual for full information about the possible workflows with third-party systems.

5.7.2. Backup of Clips

Overview

The following schema shows how the backup of clips is performed with the Gigabit connection and XTAccess:



Workflow

1. An external system, for example IP Director, sends an XML file to XTAccess to request the backup of a given clip created on an XS server .
2. XTAccess processes the XML file:
   - It gets the clip content that has to be backed up from the server.
   - It generates a backup file of the clip in the format specified by the external system (no transcoding feature, only native codec). The following formats are supported: EVS MXF, AVI, Avid MXF OPAtom, MXF OP-1A, Quick Time, Quick Time Ref (depending on the video codec).
   - It stores the backup file in the target folder specified by the external system. The metadata of the clip are either included in the file (in EVS MXF) or sent via an XML file.

5.7.3. Restore of Clips

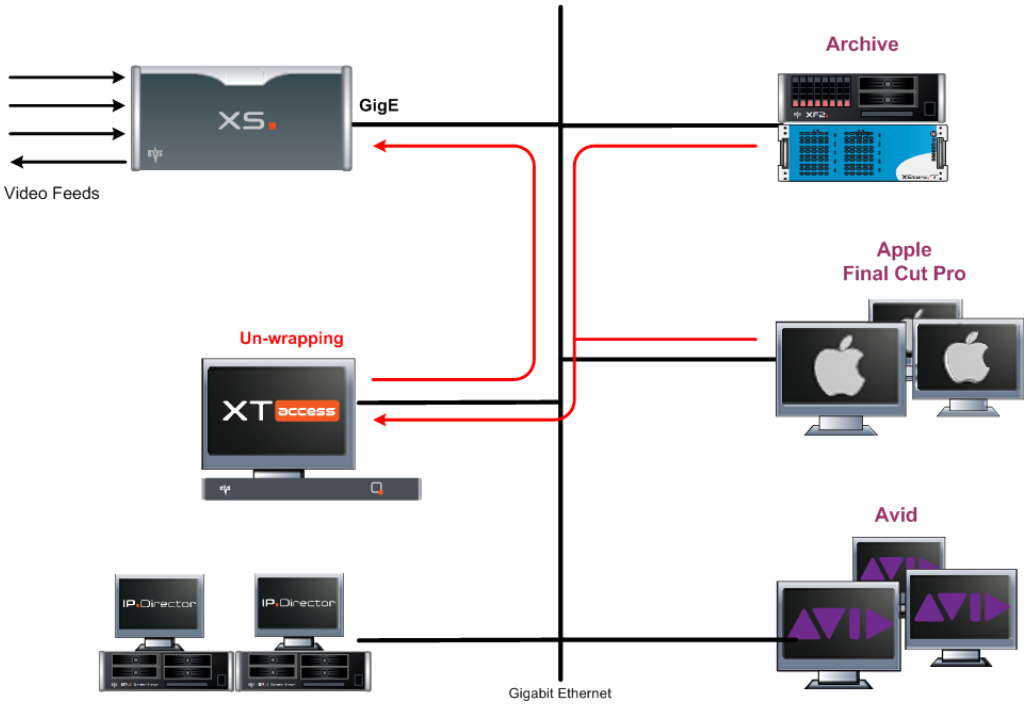
Overview

Only clips having one of the following formats can be restored: EVS MXF, MXF OP-1A, or Quick Time (depending on the video codec).

The restore process can be set up in two different ways:

- Via XML file sent by the external application.
- Via folder scan.

The following schema shows how the restore of clips is performed with the Gigabit connection and XTAccess:



Workflow (Restore via XML File)

1. An external system (which can generate XML files for restoring clips, for example MediaXChange or IPDirector) sends an XML file to XTAccess to request the restore (copy) of clips from an archiving or backup system to a given XS server.
2. XTAccess processes the XML file:
   - It gets the clip file to restore from the external system.
   - It restores, i.e. copies, the clip on the server specified in the XML file.

Workflow (Restore via Folder Scan)

1. Based on the parameters defined in XTAccess, this application scans specific folders on external backup or archiving systems.
2. When a clip file has been written to the scanned folder, XTAccess creates a copy of the clip on the server specified in the XTAccess parameters.

   The restored clip receives a new UmID and LSM ID:

   - Multicam automatically assigns a UmID to the restored clip.
   - A start LSM ID is specified in XTAccess and incremented as defined for each new clip that is restored in order to find an empty location on the server.

   The restored clip contains the clip metadata.
3. The restored clip is moved from the scanned folder to one of the following subfolders on the external archiving or backup system:
   - \Restore.done\: folder where the files are moved to when they are successfully restored.
   - \Restore.error\: folder where files are moved to when they failed to restore.

5.7.4. Important Rules

Gigabit networks including EVS servers need to abide by the following rules:

- The hardware used on GigE networks with EVS servers need to support jumbo frames.
- Both GigE ports of an EVS server need to be defined on different sub-networks.
- Teaming between the GigE1 and GigE2 ports is not possible.
- This is not possible to implement failover through the GigE network.
- The GigE port available on the MTPC board (PC LAN) is a 100Base-T port.

  This is used for monitoring purposes (XNet Monitor) or for the communication with other applications (LinX). This can be in the same sub-network as the GigE port.

5.7.5. Switches

Supported Switches

All switches used on the GigE networks of EVS systems need to support jumbo frames (Ethernet frames with more than 1,500 bytes of payload).

The following models of 19-inch Gigabit switches have been validated for use with EVS workflows:

- HP Procurve 2510G-24
- Cisco Catalyst 2960S-24TD/2960S-48TD/2960S-24TS/2960S-48TS
- Cisco Catalyst 3750X-24TS/3750X-48TS

Comparison

The models HP Procurve 2510G-24, Cisco Catalyst 2960S-24TS and 2960S-48TS can be used for small setups where no inter-VLAN routing is needed.

The models Cisco Catalyst 2960S-24TD and 2960S-48TD can be used for small setups where 10G uplinks are required, but no inter-VLAN routing is needed.

On larger setups, both GigE ports of the XS servers or/and several ports on the SANs are often used to increase the bandwidth or to allow redundancy. Since both GigE ports of an XS server cannot be used on the same sub-network, virtual LANs need to be created. To allow the transfer of packets between the virtual LANs, layer 3 switches are required. You need to select a layer 3 switch that is able to route jumbo frames.

A switch of the Cisco Catalyst 3750X series should be used on larger setups as they support jumbo frames, allow traffic to be routed between different VLANs and provide stacking capabilities.

The following table gives an overview on the supported switches:

Model/Product Number	R-U	Gb ports	Uplinks	JF switching	JF routing	Stacking	Dual PS
HP Procurve 2510G-24	1	20 (+4)	4x1G SFP	Y	N	N	No
Cisco Catalyst WS-C2960S-24TD-L	1	24	2x10GIG SFP+ or 2x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C2960S-48TD-L	1	48	2x10GIG SFP+ or 2x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C2960S-24TS-L	1	24	4x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C2960S-48TS-L	1	48	4x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C3750X-24TS	1	24	Optional module	Y	Y	Y	Optional
Cisco Catalyst WS-C3750X-48TS	1	48	Optional module	Y	Y	Y	Optional

A layer 2 device can be used when all machines are configured to be on the same LAN, when another layer 3 device is present to do the routing if needed, or when no routing between VLANs is needed.

The following table gives the list of available uplink modules for the Cisco Catalyst switches of the WS-C3750X series:

Product Number	Description
C3KX-NM-1G	Four GbE port network module
C3KX-NM-10G	Two 10GbE SFP+ ports and Two SFP ports network module
C3KX-NM-10GT	Two 10GB-T ports network module

Additional Information

HP switches have a lifetime guarantee with next-business-day advance replacement with no additional contract purchase.

HP switches are not compatible with Cisco's proprietary protocols (ISL, PagP, PVST, etc.) which could be a problem for integration in some legacy Cisco environment. However, such a case is quite unlikely to arise and most of the time workarounds can be found.

The stacking possibilities of the Cisco 3750X series permit to have fully active LACP teams for redundancy to the hosts.

5.8. GPIO Connections

5.8.1. GPIO Connector Pin-Out

The following table lists the GPIO connector pin-out:

1	Relay Out 4	14	Relay Out 4
2	Relay Out 3	15	Relay Out 3
3	Relay Out 2	16	Relay Out 2
4	Relay Out 1	17	Relay Out 1
5	IN + opto 4	18	IN - opto 4
6	IN + opto 3	19	IN - opto 3
7	IN + opto 2	20	IN - opto 2
8	IN + opto 1	21	IN - opto 1
9	I/O TTL 8	22	GND (Return I/O 8)
10	I/O TTL 7	23	GND (Return I/O 7)
11	I/O TTL 6	24	GND (Return I/O 6)
12	I/O TTL 5	25	GND (Return I/O 5)
13	+ 5 V 50 mA max.		

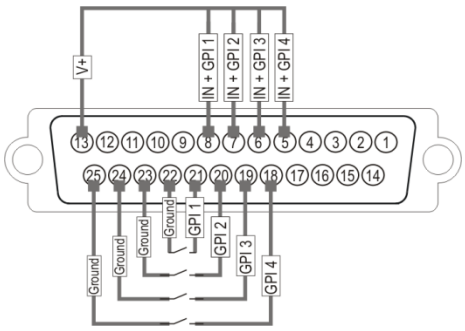
5.8.2. GP In Connections

GPI Triggers

The allocation of the XS server GPI triggers is performed in the Multicam Configuration window, in the GPI tab. See the Configuration manual for detailed information on allocating GPI triggers.

Opto isolated Inputs (GP In 1, 2, 3, 4)

Pin-Out



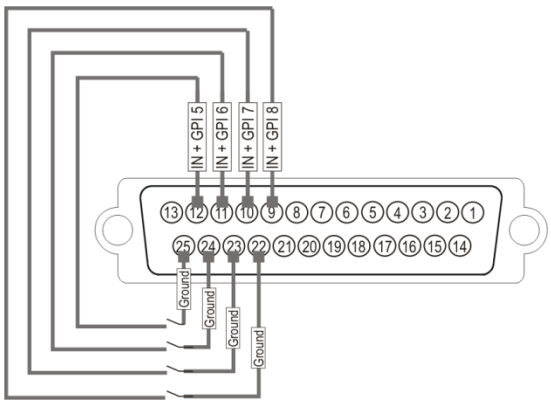
Specifications

- The input consists in an opto diode (VF @ 1.1 Volt) in series with a 470 ohm resistor.
- Typical switching point @ 1.4 mA, for secure operation:
  - i=0 to 0.5 mA -> opto OFF
  - i=2.5 to 30 mA -> opto ON
  - imax= 30 mA
- Direct connection to a TTL/CMOS signal possible (Pin opto - to GND and pin opto + to the TTL/CMOS signal).

  Typical switching point @ 1.6 Volts, for secure operation:
  - Vin< 0.8 Volts -> opto OFF
  - Vin> 2.2 Volts @ 2 mA -> opto ON
  - Vin max (without external resistor) = 15 Volts

TTL Inputs (GP In 5, 6, 7, 8)

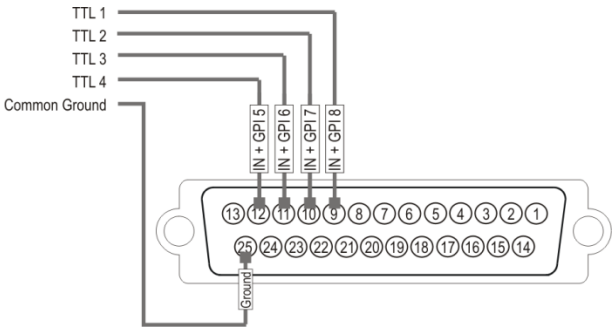
Relay Inputs Pin-Out



The relay must be connected between the ground and the corresponding TTL input on the DB-25.

TTL Inputs Pin-Out

Each TTL input on the DB-25 is directly connected to the pin of the TTL connector on the device triggering the GPI. The ground must be common between the DB-25 connector of the XS server and the external device.



Specifications

- each pin can be individually configured as an output or an input
- internal 4K7 pull up to +5 V
- low level Vi < 1.5 Volt (U12 = 74HC245)
- high level Vi > 3.5 Volt (U12 = 74HC245)
- optional TTL compatible level (U12 = 74HCT245)

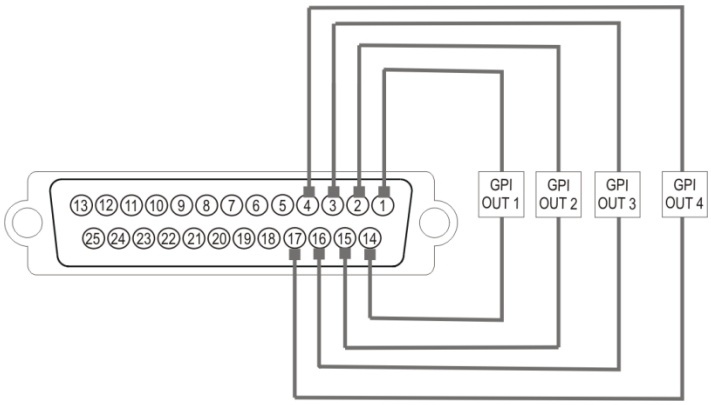
5.8.3. GP Out Connections

Relay Isolated Outputs (GP Out 1, 2, 3, 4)

Pin-Out

The user can define the functions, types and settings associated to the GPI outs in the following applications:

- Setup menu of the Remote Panel
- IP Director settings (GPI and Auxiliary Track tab)

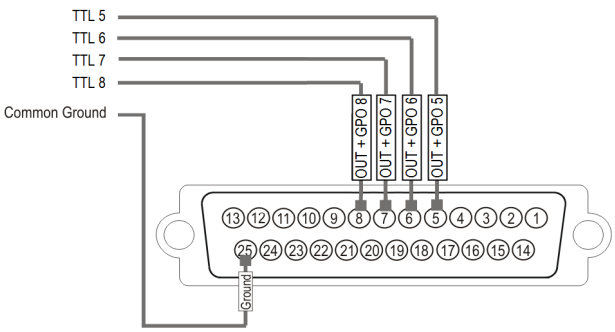


Specifications

- normally open contact (power off -> open)
- maximum 1 A
- maximum 50 Volts
- typical life time: 100.000.000 switchings

TTL Outputs (GP Out 5, 6, 7, 8)

Pin-Out


TTL 5
TTL 6
TTL 7
TTL 8
Common Ground
OUT + GPO 8
OUT + GPO 7
OUT + GPO 6
OUT + GPO 5
13 12 11 10 9 8 7 6 5 4 3 2 1
25 24 23 22 21 20 19 18 17 16 15 14
Ground

Specifications

- each pin can be individually configured as an output or an input
- internal 4K7 pull up to +5 V
- low level Vi < 1.5 Volt (U12 = 74HC245)
- high level Vi > 3.5 Volt (U12 = 74HC245)
- optional TTL compatible level (U12 = 74HCT245)

6. Boards Description

6.1. Boards and Slots Configuration

The XS server is equipped with several boards that are all developed by EVS.

According to your server version, the following setup configurations are available:

6U Rack

Slot #	Installed boards		
	6 video channels	4 video channels	2 video channels
7	RSAS		
6	H3X		
5	CODA (Audio Codec)		
4	V3X (SD/HD) #3	—	—
3	V3X (SD/HD) #2	V3X (SD/HD) #2	—
2	V3X (SD/HD) #1 Genlock	V3X (SD/HD) #1 Genlock	V3X (SD/HD) #1 Genlock
1	MTPC		

5U Rack

Slot #	Installed boards	
	4 video channels	2 video channels
6	RSAS	
5	H3X	
4	CODA (Audio Codec)	
3	V3X (SD/HD) #2	—
2	V3X (SD/HD) #1 Genlock	V3X (SD/HD) #1 Genlock
1	MTPC	

6.2. V3X Video and Reference Boards

6.2.1. Description

The V3X board is divided in 3 parts: a base board identified as V3X base (rear section and center extension), and two modules identified as COD A V3X (front left) and COD B V3X (front right).

The COD A V3X and COD B V3X modules are the actual codec modules, each of them being able to be configured by software either as an encoder (for a record channel) or as a decoder (for a play channel). The COD V3X modules are SD, HD, and 3 Gbps capable.

They support the following new feature(s):

- Full resolution 3D HD on a single V3X module (Dual Link HD SDI or single link 3 Gbps)
- 1080p 50/59.94 Hz video standard on a single V3X module (Dual Link HD SDI or single link 3 Gbps)

There are 2 versions of the V3X board: one with genlock, one without genlock.

The genlock model can easily be identified by the presence of 3 quartz synthesizers at the back of the V3X base board, on the right-hand side, and by the presence of the GLK and PSU OK LEDs on either side of the DIN connector at the center front of the board.

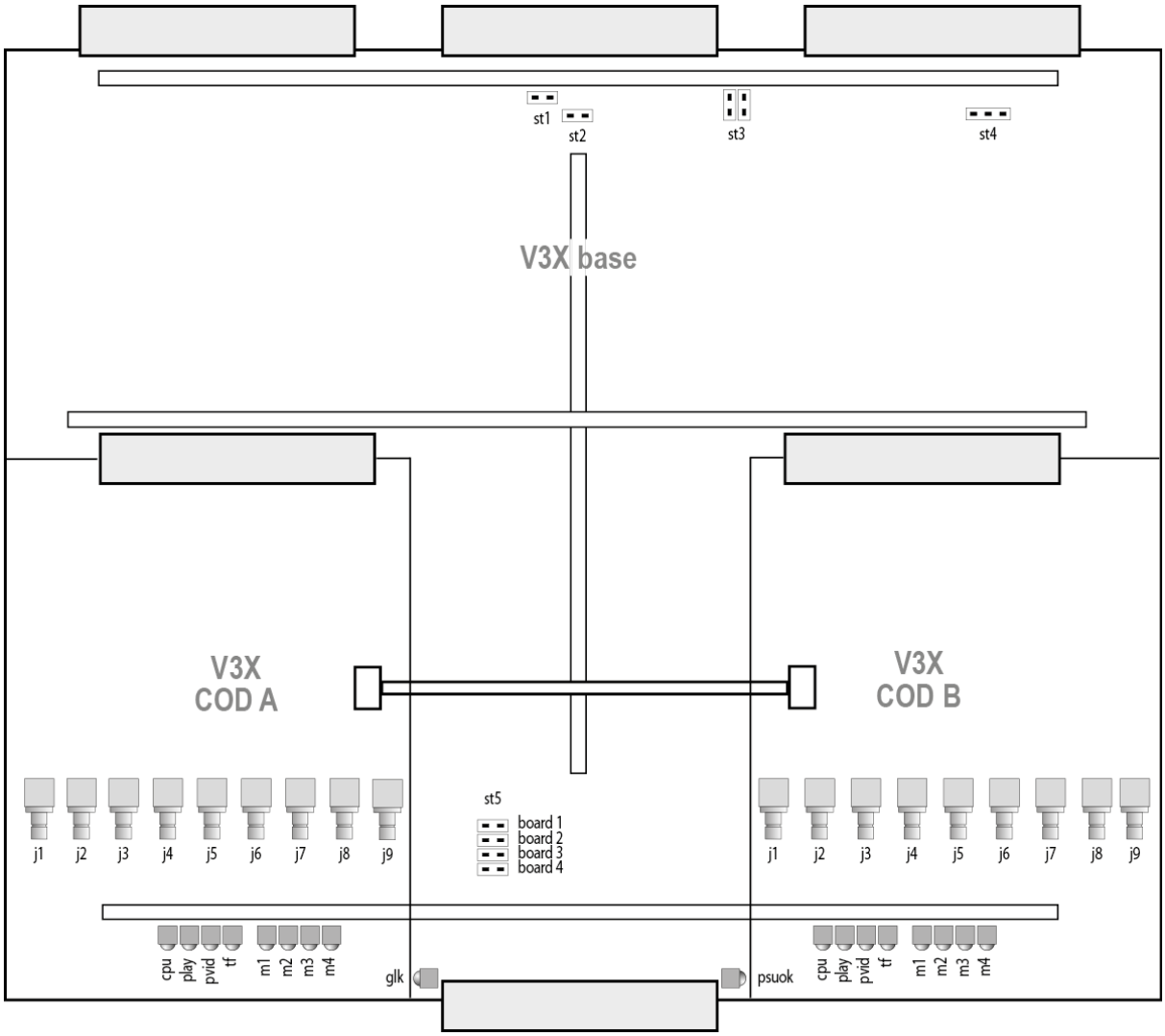
Note that a V3X board with genlock must be installed as V3X #1 in first position (slot 2) in the server. A V3X board with genlock can never be installed in any other slot, and thus cannot be used instead of V3X #2 or #3. Doing so will result in conflicting electrical signals inside the system.

Warning

It is highly advised not to remove a V3X board from your EVS server. Should you have to do so, manipulate the board very carefully, making sure it is not exposed to mechanical or electric shocks.

Block Diagram

The block diagram of the V3X board is illustrated hereunder with the connectors, jumpers and LEDs location:



Base Board Jumpers

The following table lists the V3X base board jumpers and their respective function:

Jumper	Function
ST1, ST2	These 2 jumpers must be installed on the last V3X board of the server (that is on V3X #1, 2, or 3 if there are respectively 1, 2, or 3 V3X boards installed in the server).
ST3 (SPARE)	«Parking» for ST1 and ST2 jumpers when they are not used.
ST4 (only on V3X with genlock)	Must be set to HiZ (or not installed). Note that the Genlock Loop connector on the back panel of the server (if available) must always be terminated with a 75 Ohm load if it is not used.
ST5	Defines the position of the board inside the server. It must be set to « 1 » for a V3X with genlock, and to « 2 » or « 3 » for a V3X board without genlock, depending on its position in the server.

Base Board LEDs

The following table lists the LEDs available on the V3X base board with the genlock functionality:

LED	Color	Status	Function
GLK	—	Off	The genlock module is not initialized.
	Green	Blinking	The genlock module is properly initialized, but no valid genlock signal is detected.
		On	The module is initialized and a valid genlock signal is detected.
	Red	Blinking	There is a genlock problem.
		On	A resync is needed.
PSU OK	Green	On	All voltages are present and in the allowed range.
	—	Off	There is a voltage problem.

V3X COD Modules LEDs

The following table lists the LEDs available on then V3X COD modules (from left to right):

LED	Color	Status	Function
CPU	Green	Blinking	Indicates CPU activity.
		On	There is a problem with the module processor.
PLAY	Green	On	The module is set in play mode by the software.
		Off	The module is set in record mode.
PVID	Green	On	A valid video signal has been detected on the J8 connector (SD/HD SDI input), whether the module is in play or record mode.
TF (transfer)	Green	Blinking	Data transfers occur between the module and the H3X board.
M1	—	—	Not used.
M2			
M3			
M4			

6.2.2. COD Connectivity in SD and HD

This section describes the connector assignments and layout for the video standards SD 525i, SD 625i, HD 1080i and HD 720p.

The specific connectivity for HD 3D/1080p Dual Link and 3D/1080p Single Link 3 Gbps is described in the following sections.

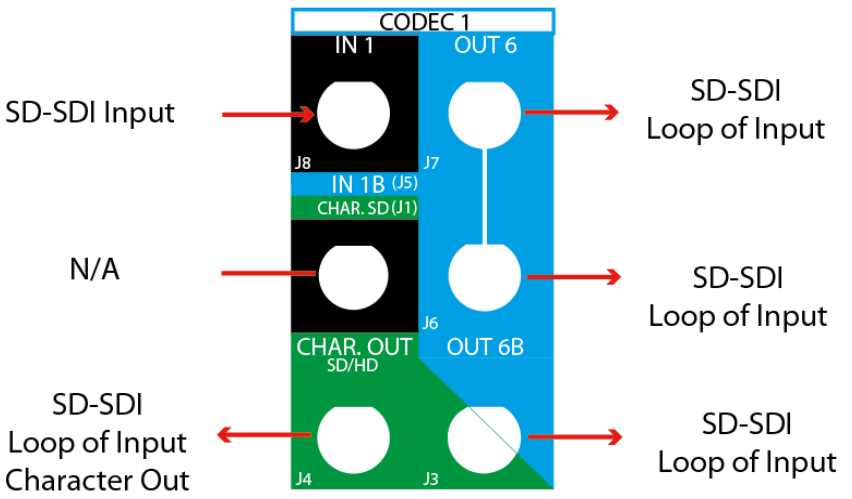
Connector Assignments

Con-nector	SD mode	HD mode	Con-nector label
J1	J5 is factory-wired to the backplane instead of J1. You can connect J1 instead of J5 if CVBS monitoring is required in SD or HD mode. ⚠ SDI monitoring is no longer available on J1.		CHAR SD
	CVBS monitoring output (SD)	CVBS monitoring output (SD, down-converted)	
J2	SDI monitoring output (SD)	SDI monitoring output (SD, down-converted)	Not wired to the backplane. Used for onboard mul-tiviewer input.
J3	Loop-through for the SDI input signal (SD)	Loop-through for the SDI input signal (SD, down-converted)	OUT B
J4	SDI monitoring output (SD)	SDI monitoring output (SD/HD)	CHAR OUT SD/HD
J5	Not used	Not used	IN B
J6	SDI program output (SD, identical to J7)	HD SDI program output (HD, identical to J7)	OUT
J7	SDI program output (SD, identical to J6)	HD SDI program output (HD, identical to J6)	OUT
J8	SDI input (SD)	HD SDI input (HD)	IN
J9	Alternate SDI input (SD, for hardware loop)	Alternate HD SDI input (HD, for hardware loop)	Not wired to the backplane. Used for internal loop in.

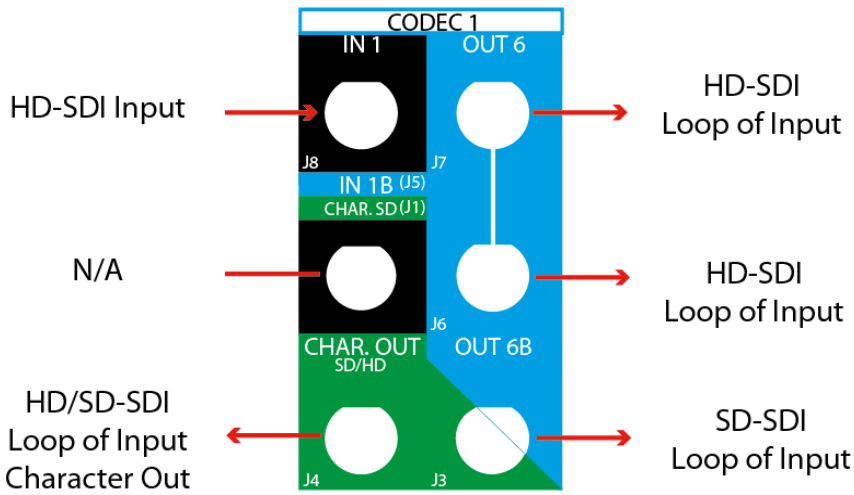
Note
The loops of the input signal are not genlocked.

Connectors Positions and Assignments

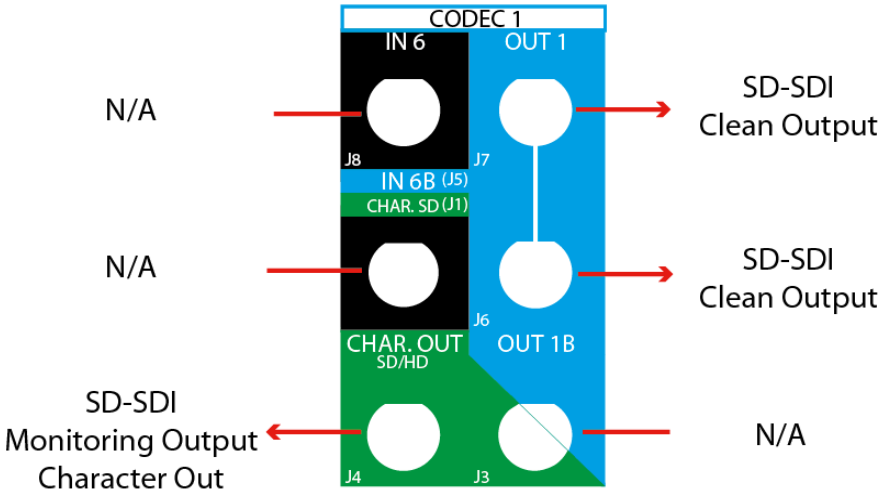
SD Mode - Input (REC)



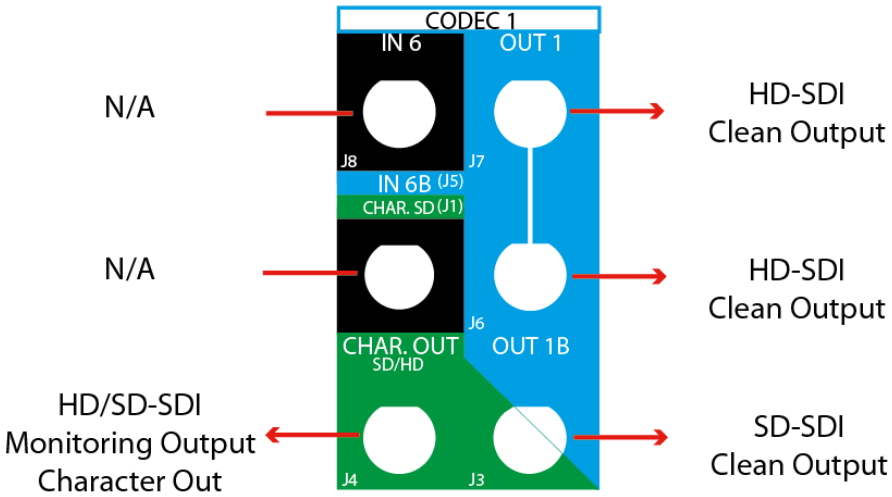
HD Mode - Input (REC)



SD Mode - Output (PLAY)



HD Mode - Output (PLAY)



6.2.3. COD Connectivity in 3D and 1080p Dual Link

This section describes the connector assignments and layout for the video standards HD 3D and 1080p in Dual Link mode.

Connector Assignments

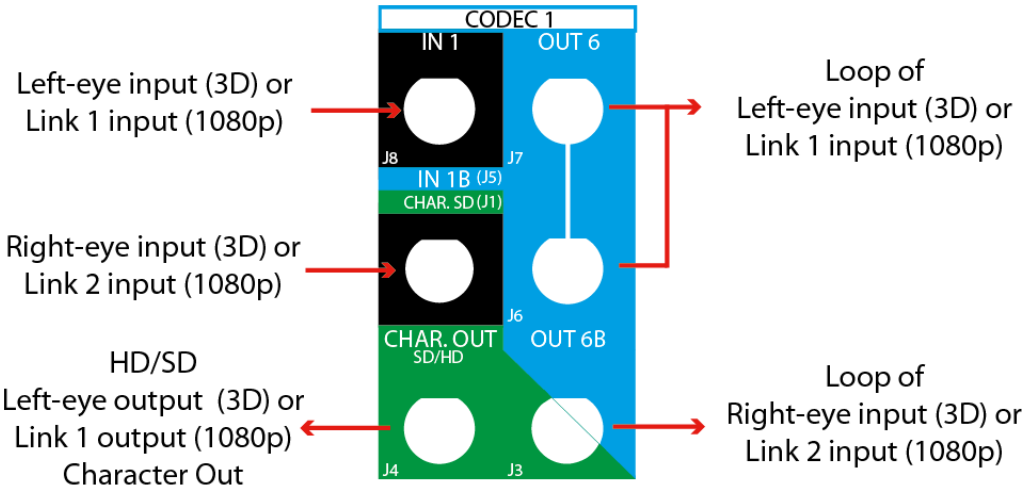
Connector	3D/1080p mode	Connector label
J1	N/A	CHAR SD
J2	SDI monitoring output (SD, down-converted)	Not wired to the backplane. Used for onboard multiviewer input
J3	HD SDI program output for right eye (3D) or link 2 (1080p) (HD)	OUT B
J4	SDI monitoring output for left eye (3D) or link 1 (1080p) (HD/SD)	CHAR OUT SD/HD
J5	HD SDI input for right eye (3D) or link 2 (1080p) (HD)	IN B
J6	HD SDI program output for left eye (3D) or link 1 (1080p) (HD, identical to J7)	OUT
J7	HD SDI program output for left eye (3D) or link 1 (1080p) (HD, identical to J6)	OUT
J8	HD SDI input for left eye (3D) or link 1 (1080p) (HD)	IN
J9	Alternate HD SDI input (HD, for hardware loop)	Not wired to the backplane. Used for loop in.

Note

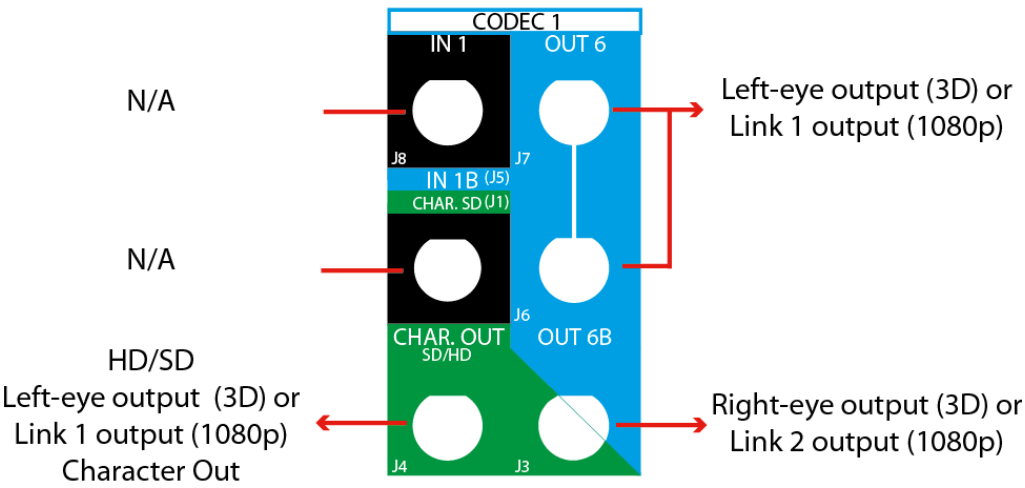
The loops of the input signal are not genlocked.

Connectors Positions and Assignments

3D/1080p - Input (REC)



3D/1080p - Output (PLAY)



6.2.4. COD Connectivity in 3D and 1080p Single Link 3G-SDI

This section describes the connector assignments and layout for the video standards HD 3D and 1080p in Single Link 3G-SDI mode.

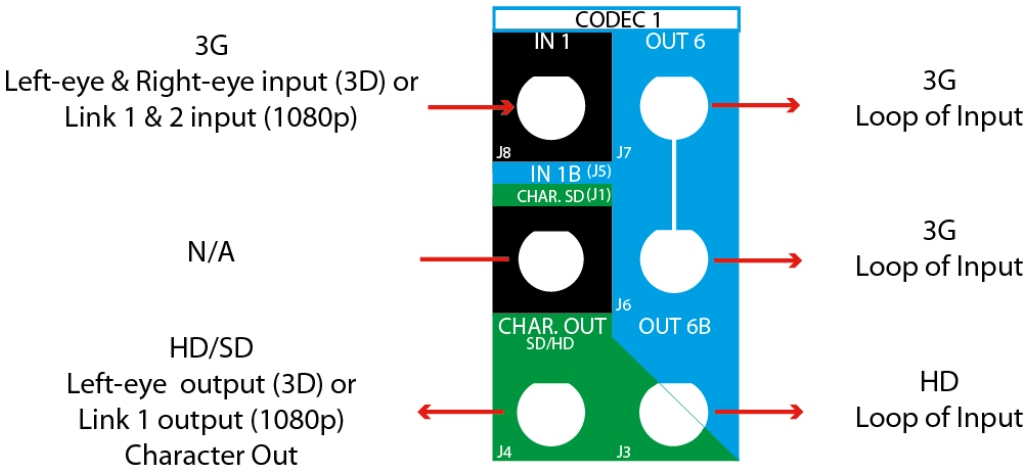
Connector Assignments

Con-nector	3D/1080p Mode	Connector label
J1	N/A	CHAR SD
J2	SDI program output 2D (SD, down-converted)	Not wired to the backplane. Used for onboard multiviewer input
J3	SDI program output 2D (HD)	OUT B
J4	SDI monitoring output for left eye (3D) or link 1 (1080p) (HD/SD)	CHAR OUT SD/HD
J5	Not installed	IN B
J6	3G-SDI program output for left & right eyes (3D) or link 1 & 2 (1080p) (3G, identical to J7)	OUT
J7	3G-SDI program output for left & right eyes (3D) or link 1 & 2 (1080p) (3G, identical to J6)	OUT
J8	3G-SDI input left & right eyes (3D) or link 1 & 2 (1080p) (3G)	IN
J9	Alternate 3G-SDI input (3G, for hardware loop)	Not wired to the backplane. Used for loop in.

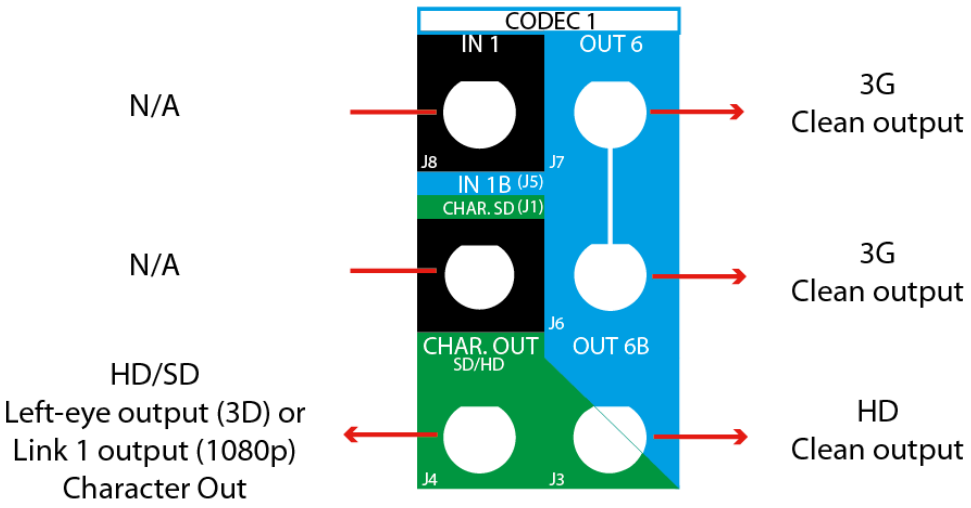
Note
The loops of the input signal are not genlocked.

Connectors Positions and Assignments

3D/1080p - Input (REC)

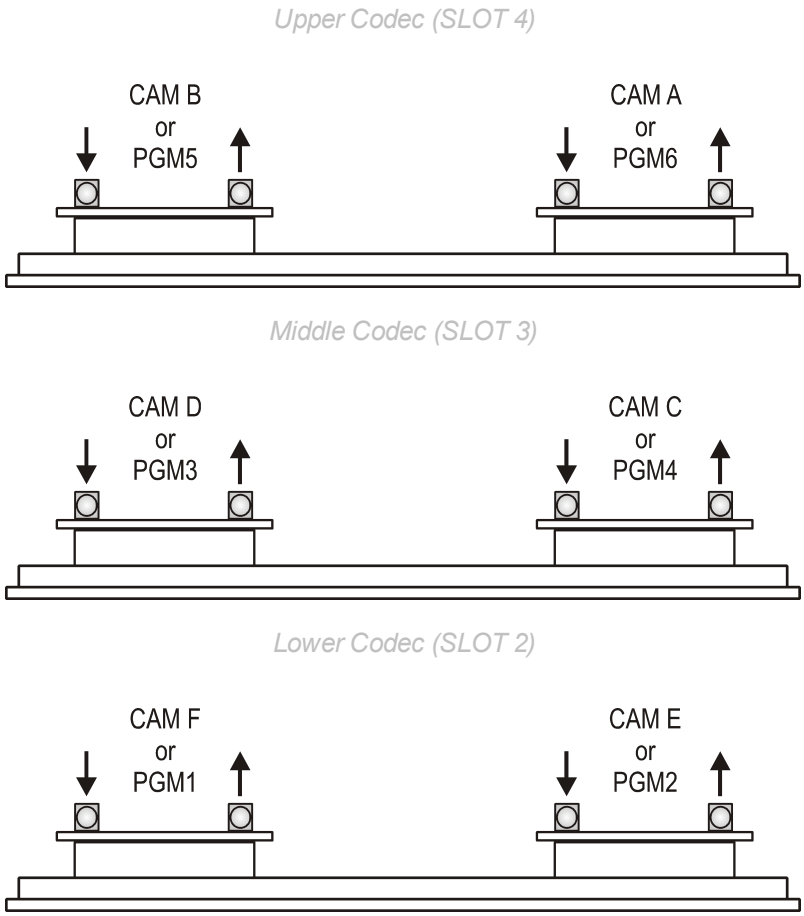


3D/1080p - Output (PLAY)

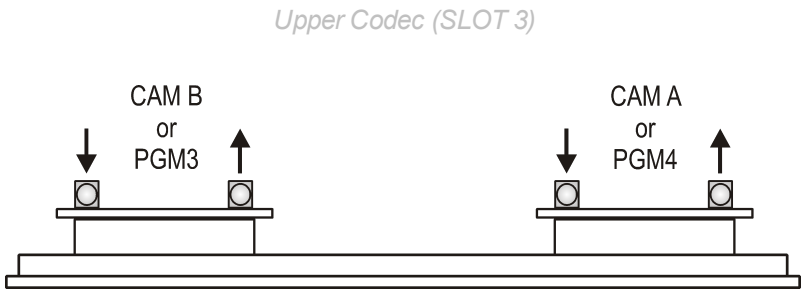


6.2.5. Channel Assignment

6 Channels Server



4 Channels Server



Lower Codec (SLOT 2)

2 Channels Server

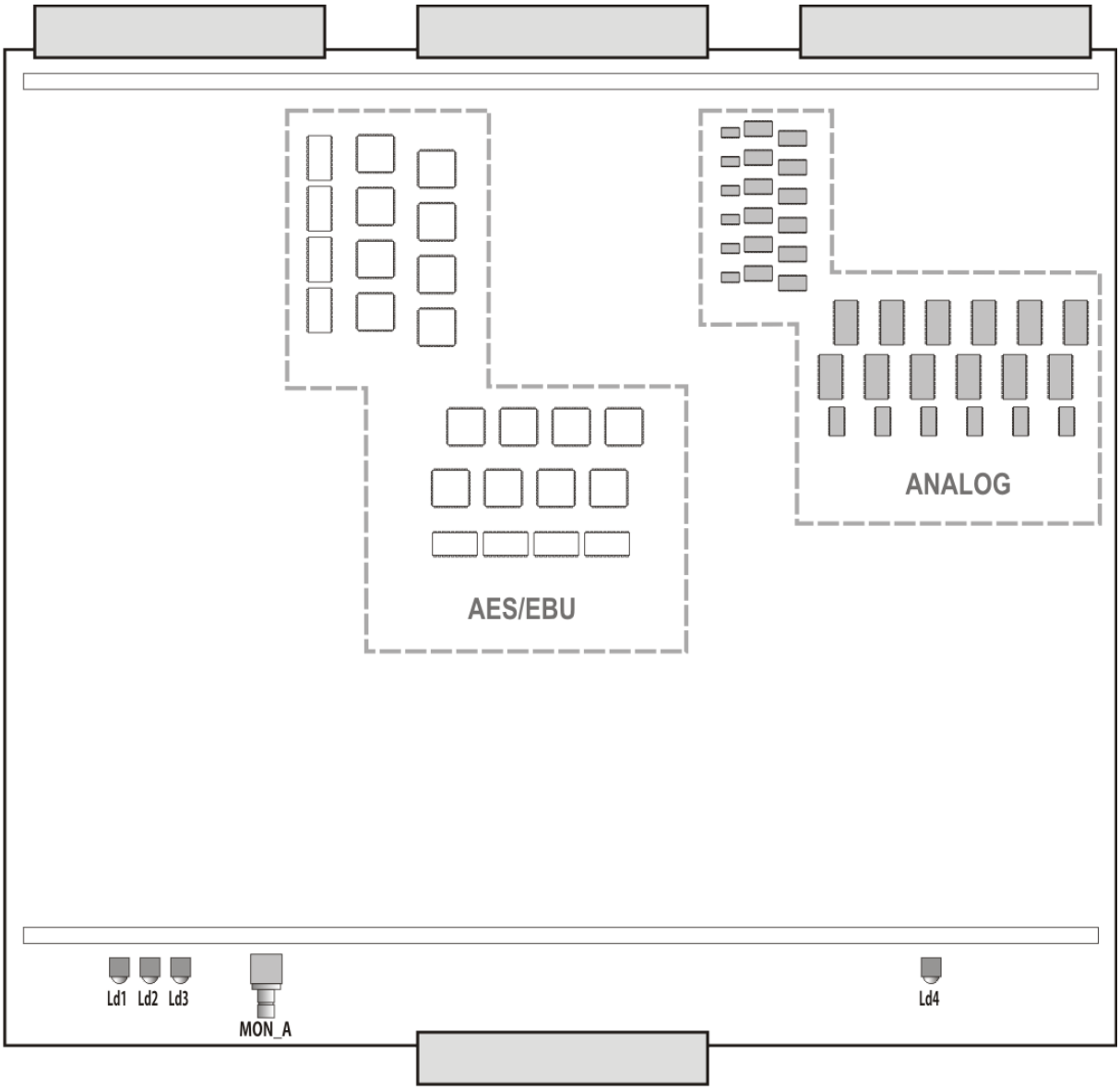
Lower Codec (SLOT 2)

6.3. Audio Codec Board

The audio codec board is the audio interface between the V3X boards and the H3X board. Video codec and audio codec boards are tied to the H3X board with one bus connector on the front side. Different audio configurations are available with the audio codec board. See "Audio Connections" on page 45 for details.

The following LEDs are available on the audio codec board:

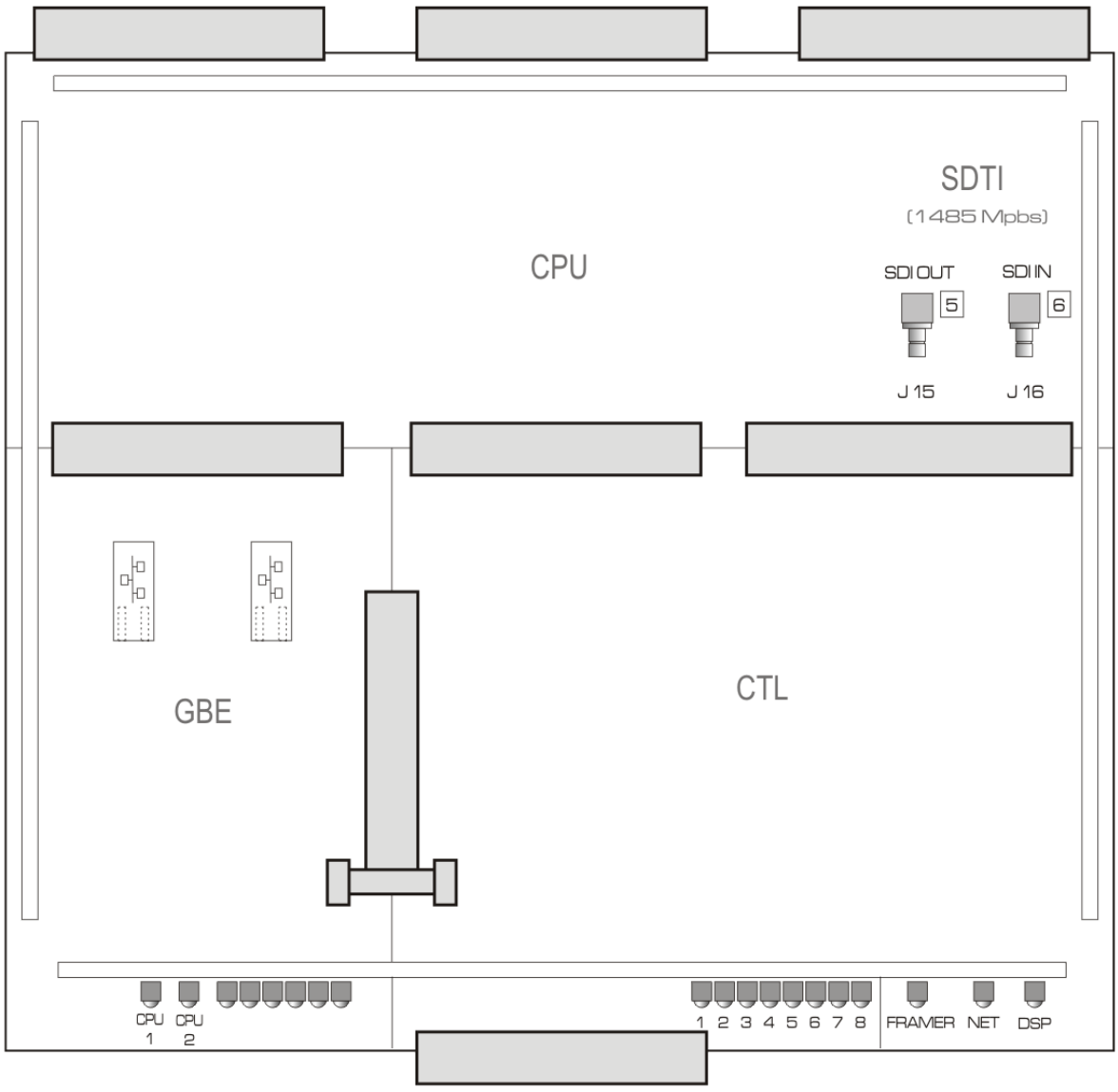
- LD 1-3: internal EVS information only.
- LD 4: transfer activity to/from the H3X board.



6.4. H3X Board

The H3X board is divided in 4 parts (2 in front, 2 in the back).

- Front left: GBE (GigE) module.
- Front right: CTL controller module.
- Back left: CPU module .
- Back right: SDTI module.



LEDs Function

The available LEDs on the XNet2CTL controller module are, from left to right:

LED	Color	Status	Function
LED 1	Green	On	Ok.
	Red	On	An error occurred while booting the H3X board.
LED 2 to LED 8	—	—	For EVS internal use only.
FRAMER	Green	On	The signal on the XNet2 IN connector is a valid EVS SDTI signal.
NET	Green	On	The XNet2 SDTI network is established (SDTI loop closed, correct speed, etc).
DSP	Green	Blinking	Indicates DSP activity (audio processing).

The available LEDs on the GBE Gigabit module module are, from left to right:

LED	Color	Status	Function
CPU1 CPU2	Green	Blinking	These LEDs blink alternately every 250 milliseconds to indicate that the processor is running.
Other LEDs	—	—	For EVS internal use only.

Connectors

The following connectors are available on the XNet2 (SDTI) module:

J15	OUT connector for XNet2 (SDTI network 1485 Mbps without relay).
J16	IN connector for XNet2 (SDTI network 1485 Mbps without relay).

Gigabit Connectors

The two board Gigabit connectors are connected to the two backplane Gigabit ports.

The Gigabit connectors must be on a network that supports Jumbo Frames of (at least) 9014 bytes Ethernet frames. One of the tested switch belongs to the Cisco 3750 G family, for example the WS-C3750G-24T-S.

You can set up the GigE IP addresses in the Multicam Configuration window, in the Network tab, Gigabit Ethernet section.See the Configuration manual for more information.

6.5. RAID Controller Boards

6.5.1. RCTL Board on SAS Disk Array

Disk Arrays on systems with H3X boards have a controller on the disk array board.

Different configurations can be used

- One internal array with a series of 6 disks
- One internal array with two stacked series of 6 disks,
- No internal storage

LEDs on Internal Array

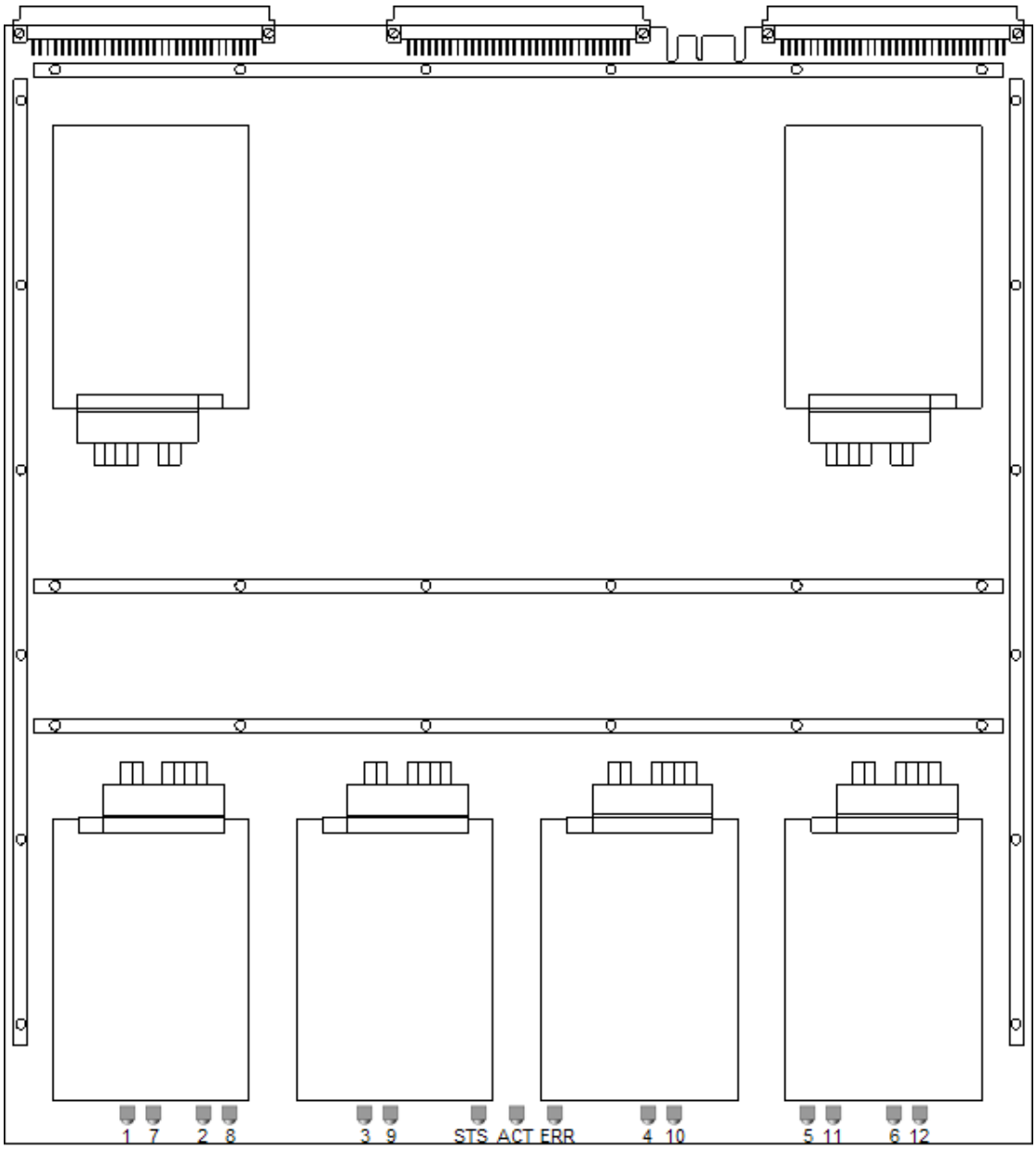
LEDs 1 to 6 are used in case of one internal array of 6 disks.

LEDs 7 to 12 are used for the upper series of disks in case of one internal array of 2x6 disks.

LEDs correspond to the disks as schematized as followed:

upper	7			12
lower	1			6
upper	8	9	10	11
lower	2	3	4	5

LED	Status	Function
Disk LEDs	Off	the corresponding disk is not started (not spinning)
	On, fast blinking (green)	the corresponding disk is starting (spinning)
	On, steady (green)	the corresponding disk is started and used in the RAID array
	On, slowly blinking (green)	the corresponding disk is started but not used in the RAID array
STS	On (green)	the RCTL RAID controller is properly booted.
ERR	On (red)	errors occur during the data transfer between the RAID controller and the disks



6.5.2. External RAID Array SAS-HDX

The SAS-HDX is a 2U external disk storage containing up to 24 hot-swappable SAS disks, with a minimum of 5 disks. External storage can be used with or without internal storage.

It is connected to the server via a dedicated SAS cable on the rear panel of the server, provided that the X-ESAS connection module has been placed inside the server.

Necessary equipment:

- Server with SAS-HDX connector on the rear panel.
- Multicam version 10.05 or higher
- SAS-HDX external disk storage

LEDs on the External Array

For each disk, a blue LED and a red LED are present.

Status		Function
Blue Led	Red Led	
Off	On (steady)	Defect drive – must be replaced.
Blinking	Off	Connected, disk being written to / read from.
On (steady)	Off	Connected, disk not currently written to / read from.
On (steady)	On, slowly blinking	Spare disk - the corresponding disk is started and used in the RAID array.
Off	Off	The corresponding disk is not present.

Note

When starting from a clean disk array (after a “Clear Video Disks” from the EVS maintenance menu), the server is recording first on RAID #0 until this one is full, then on RAID #1 and finally on RAID #2. It is therefore normal to see activity only on some disks depending on how much material (clips and record trains) is stored on the server.

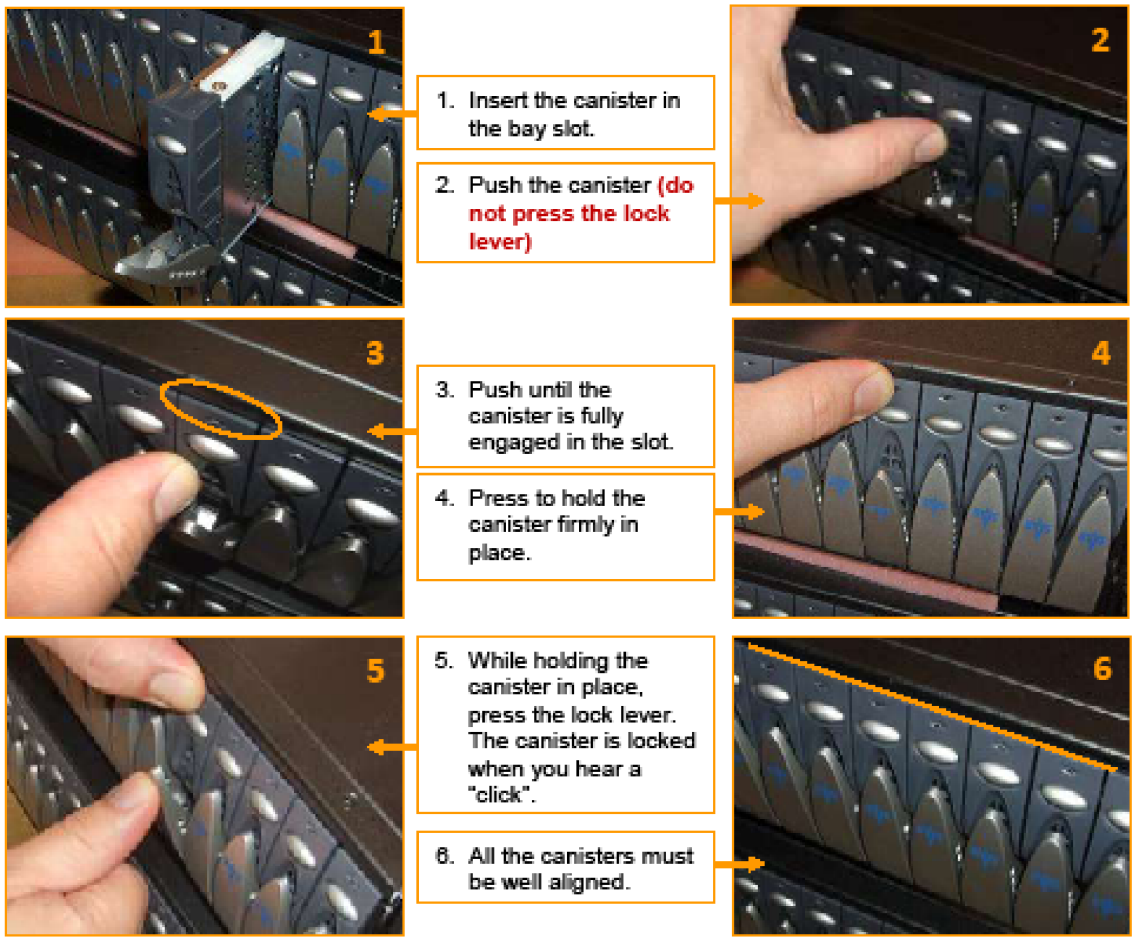
Sound Alert on External Array

When a fan or a power supply unit fails on an external array, a sound alert is given and can be stopped by pressing the Mute button on the array.

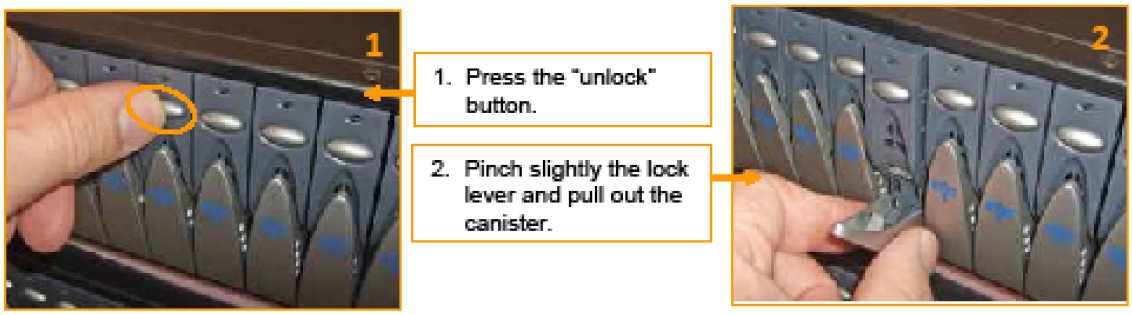
Disk Insertion and Removal

To insert or remove a disk from an external array, carefully follow these steps:

1. **How to insert**


1
2
3
4
5
6
1. Insert the canister in the bay slot.
2. Push the canister (do not press the lock lever)
3. Push until the canister is fully engaged in the slot.
4. Press to hold the canister firmly in place.
5. While holding the canister in place, press the lock lever. The canister is locked when you hear a "click".
6. All the canisters must be well aligned.

2. **How to remove**



6.6. MTPC A3/A6 Board

Introduction

The function of the PC board is mainly the control of the video hardware and the interface of the peripheral equipment (such as a remote controller) with the video hardware.

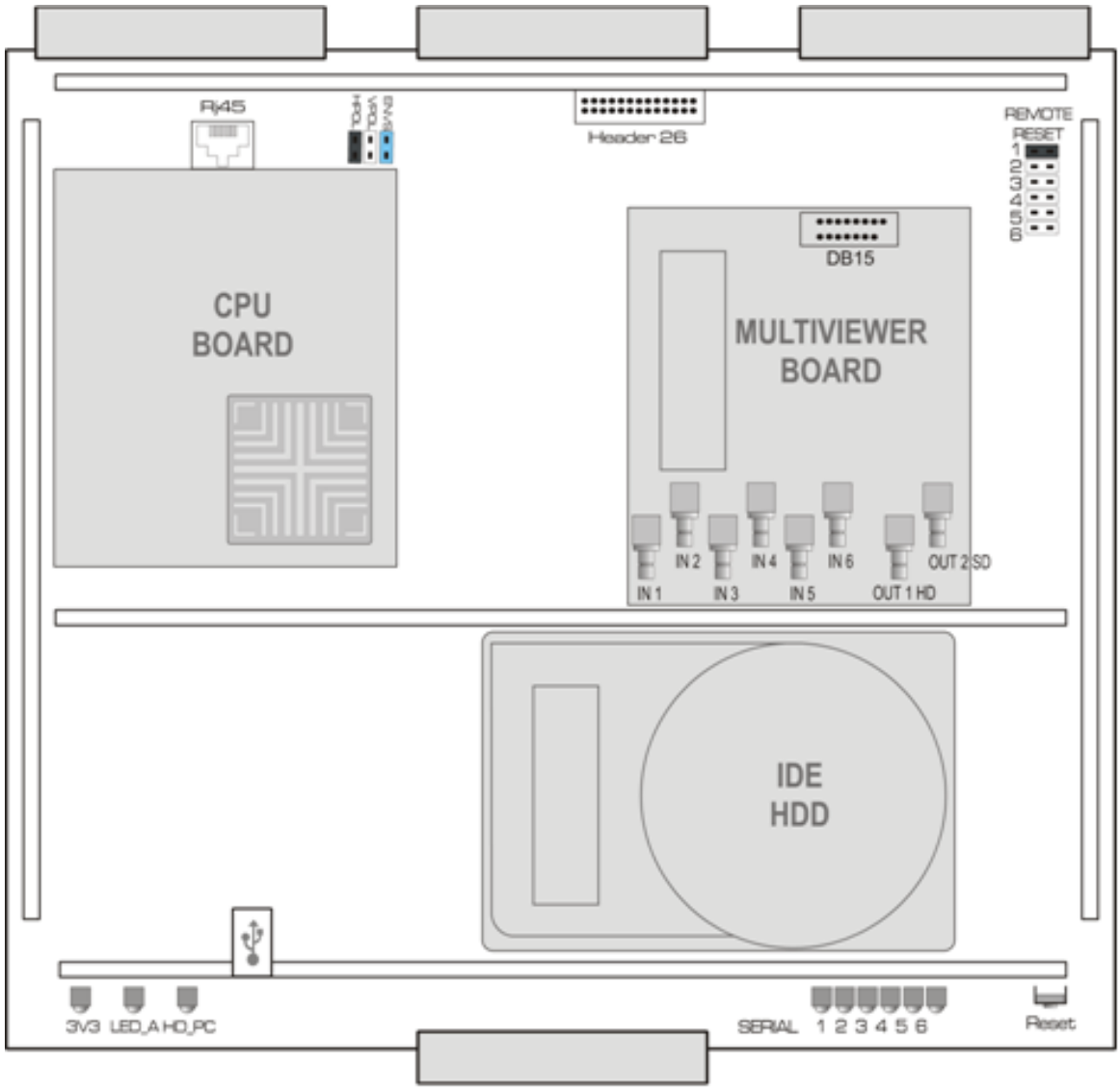
The following MTPC board is used:

- Revision A3/A6 with COMMEL HS873 motherboard and a new time code management module (with bootable USB).

In standard configuration the PC hardware is composed of:

- One mounting PC board, with serial ports, LTC reader and generator, is controlled by the motherboard.
- IDE System Hard disk: the IDE disk drive is used for storing the EVS software and the DOS operating system. Neither audio nor video data is saved on this disk. The capacity of this drive may vary depending on market availability, but the system partition is always set to 1 GB. The remaining capacity of this drive is not used.
- 128 MB SDRAM (or higher) modified. The SDRAM used has been modified to suit the system requirements. Please contact EVS support for RAMs upgrade. Do not use standard PC RAM modules.

Illustration



Multiviewer

The multiviewer board is an option on XS servers.

Connectors	Function
IN	The J2 connectors from the CODEC modules of the COHX board are connected to the IN connectors of the multiviewer board.
OUT1 HD	The OUT HD connector of the multiviewer board is connected to the MULTIVIEWER HD SDI connector on the rear panel of the server.
OUT2 SD	The OUT SD connector of the multiviewer board is connected to the MULTIVIEWER SD SDI connector on the rear panel of the server.
DA-15	The DA-15 connector of the multiviewer board is connected to the MULTI DA-15 connector on the rear panel of the server.

LED Information

Internal EVS information

Board Configuration

HPOL, VPOL and ENVS are used to configure the composite sync generator used in LSM TV mode (no effect if the server is only used with a VGA monitor).

The HPOL jumper can be used to invert or not the VGA HS signal (Horizontal Sync) to generate the composite output signal (TV mode)

The VPOL jumper can be used to invert or not the VGA VS signal (Vertical Sync) to generate the composite output signal (TV mode)

The ENVS jumper can be used to enable or not the presence of the VGA VS signal (Vertical Sync) in the composite output signal (TV mode)

If the LSM TV mode is used, these jumpers must be set up according to EVS recommendations, which depend on software version and CPU board model/revision:

Set up the jumpers as follows:

- HPOL=On; VPOL=Off; ENVS=On

REMOTE RESET jumpers are available to designate the remote(s) from which the RESET command can be sent.

This command resets the whole system: PC and video hardware.

In standard configuration only Remote one (on RS422 port 1) is allowed to reset the system.

Warning

This jumper should be removed if the device connected to the RS422 port is NOT an EVS controller. Maximum voltage on pin 5 of an RS422 port of the server should not exceed 5 Volt when the corresponding jumper is engaged. Applying a higher voltage on pin 5 when the corresponding jumper is engaged will result in permanent electronic damage to the board.

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